VOL. XXIII, NO. 6 DECEMBER, 1949

THE TOOL ENGINEER

OFFICIAL PUBLICATION: AMERICAN SOCIETY OF TOOL ENGINEERS

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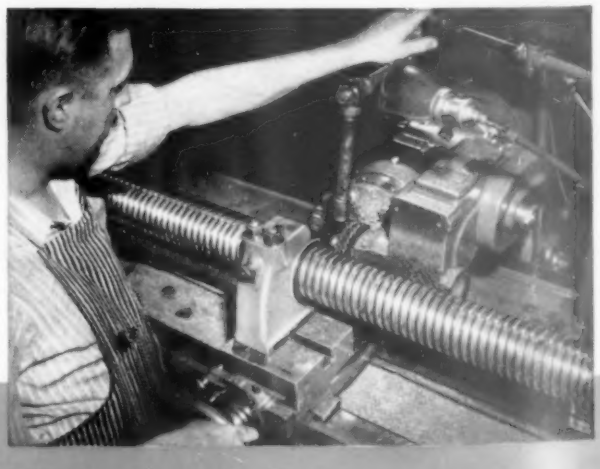
RIGHT: TWO-START PRECISION FEED SCREW. Setup with double cutters on 6" x 120" Machine for precision milling of a two-start accurate feed screw. Both starts were finish-milled simultaneously.



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December, 1949

Vol. XXIII No. 6

Editorial

A Step Toward the Future

This month ASTE has realized a long-cherished aim toward developing its educational efforts and building a greater society. We have, for the first time, correlated all publishing functions of *The Tool Engineer* into an integrated operation, under the direct control of the Society.

Taking over complete operation of The Tool Engineer has been the aim of the Society for a number of years. Considerable planning has preceded this move, in order that each member and the Society as a whole would benefit.

It has been felt, for example, that closer contact between *The Tool Engineer* staff and the various national and local committees would be of considerable value in presenting increased news coverage. In addition, opportunities for more effective cooperation between the magazine and other Society functions will be to the advantage of both.

Planning such as this, together with the vital headquarters technical organization and the proposed national ASTE-sponsored research programs announced at Montreal, aid our present members while simultaneously enhancing ASTE's national prestige.

A separate section of ASTE's new National Headquarters building now houses *Tool Engineer* operations. Additional appointments have been made to augment the advertising and production departments. Thus the physical steps have been taken to complete what is a logical expansion of ASTE services to its members.

But aside from these physical steps, this move represents a psychological milestone for ASTE. It marks another point in the growth of a society which already has had tremendous surges of growth. A magazine operated entirely by the Society, guided by the advice of an editorial committee composed of tool engineers, provides more and better news for each member and brings each member closer to the Society. In addition, it offers each member an even greater opportunity to work for the success of the magazine and, in turn, for the success of the Society.

It seems somehow fitting that this move should occur almost at the beginning of a new year. I sincerely hope that it will mean the beginning of a new and more impressive chapter in ASTE's history.

To each member and his family, my warmest good wishes for a very Merry Christmas and for happiness and prosperity in the New Year.

R B Douglas

THE TOOL ENGINEER is published monthly in the interest of the members of the American Society of Tool Engineers. Entered as second class matter. November 4, 1947, at the post office at Milwaukee, Wisconsin, under the Act of March 3, 1879. Yearly subscription, $2.00. Non-members, $6.00. Canada, $6.50; all other foreign countries, $8.00 per year.
OFFICE OF PUBLICATION (printing) 239 E. Chicago St., Milwaukee, Wis. ADDRESS ALL CORRESPONDENCE TO: EDITORIAL AND ADVERTISING OFFICES: 550 W. Lafayette Blvd., Detroit 26, Mich. NATIONAL HEADQUARTERS: American Society of Tool Engineers, 10700 Puritan Ave., Detroit 21, Michigan.

Here's a tapping technique, you can see at a glance
Will show up the gambler who "takes a long chance".

It leads to conviction, sentence and jail!
For it don't pay to have the wrong horse by the tail!

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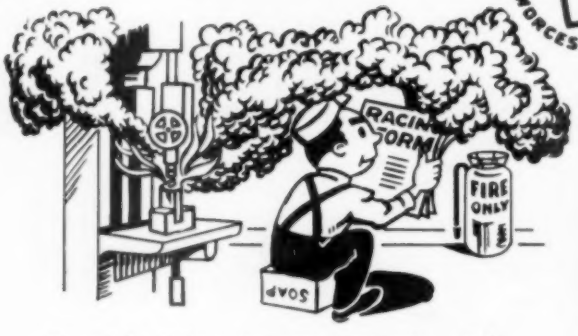
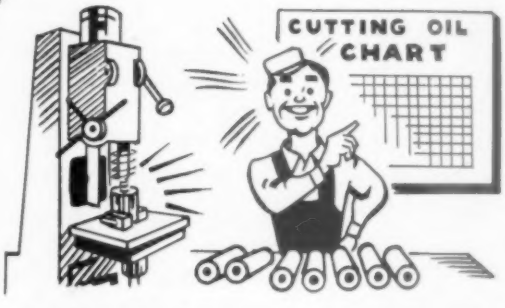


Some folks "take a chance" when tapping a hole
By running taps dry — with no friction control.



Just bathe your Bath taps with the right film of oil,
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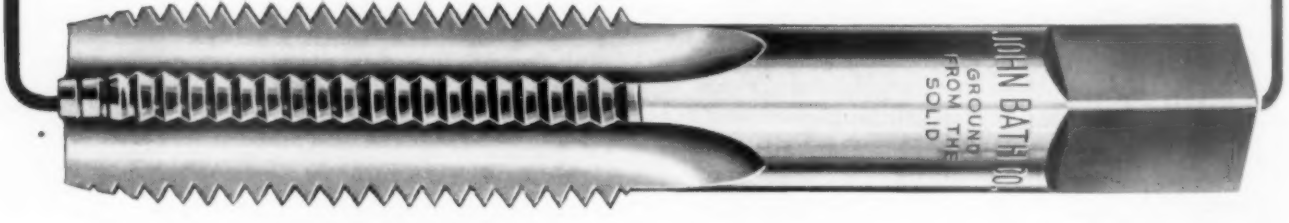

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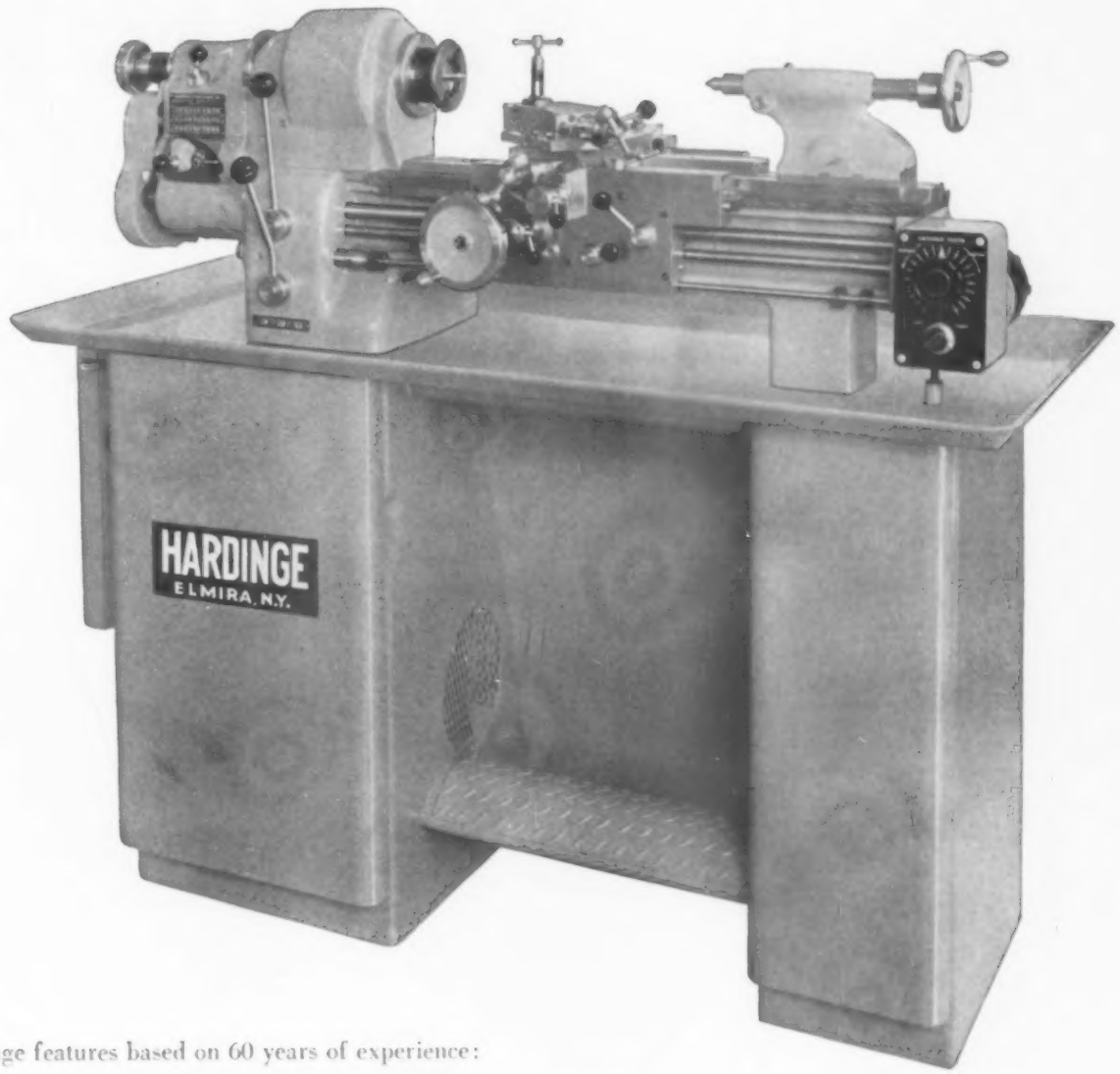

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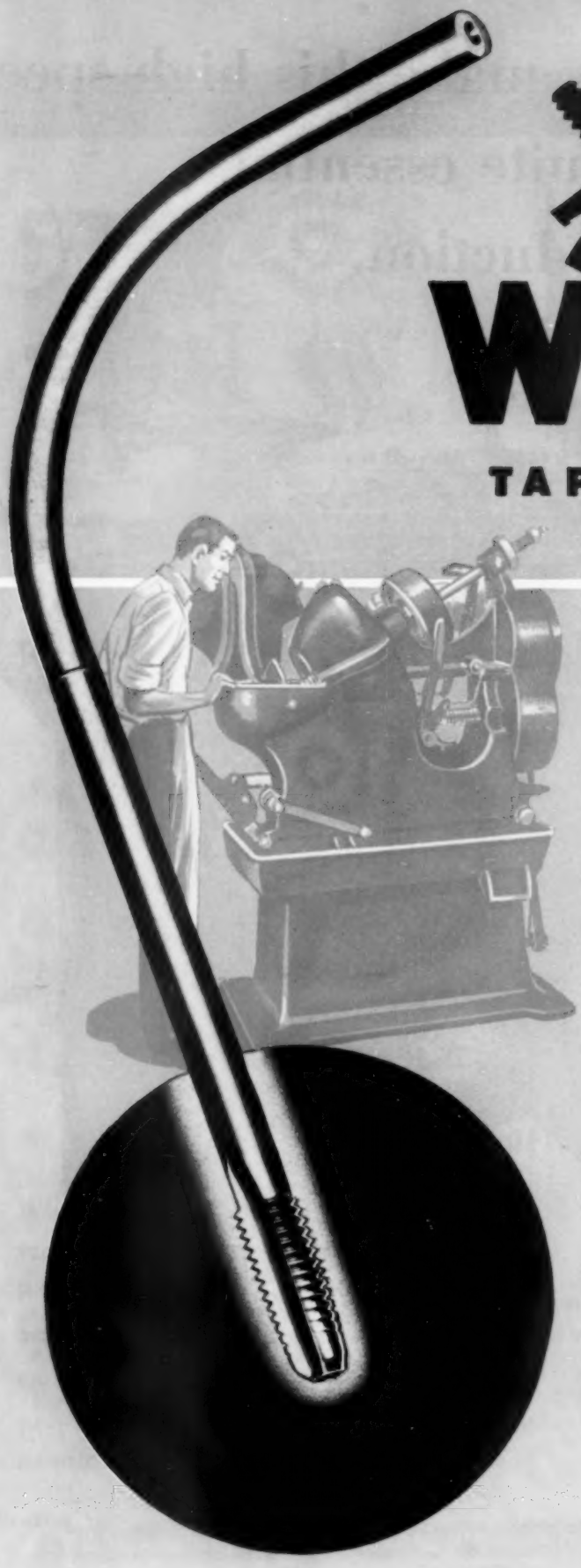

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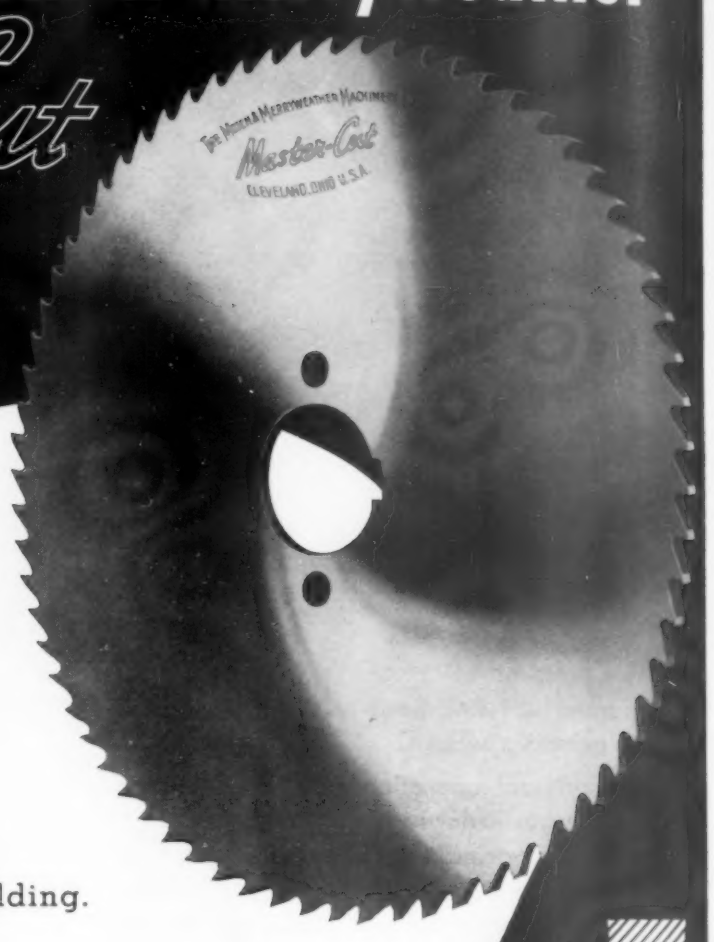

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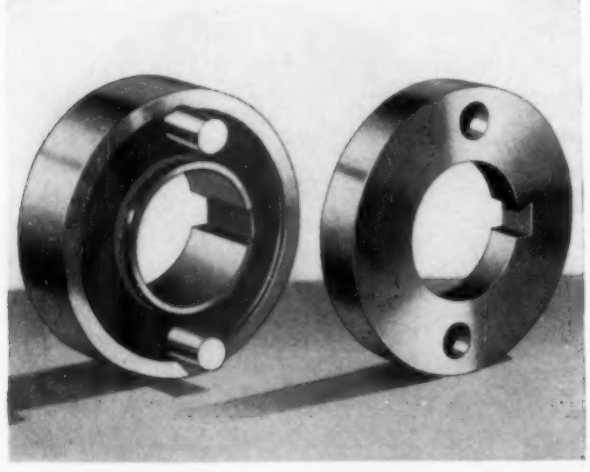

Motch & Merryweather Dual Drive Adaptors allow the same blade to be used on a range of arbor sizes. The adaptor is keyed to the arbor to provide ample driving power.

Ask for Bulletin "T-12".

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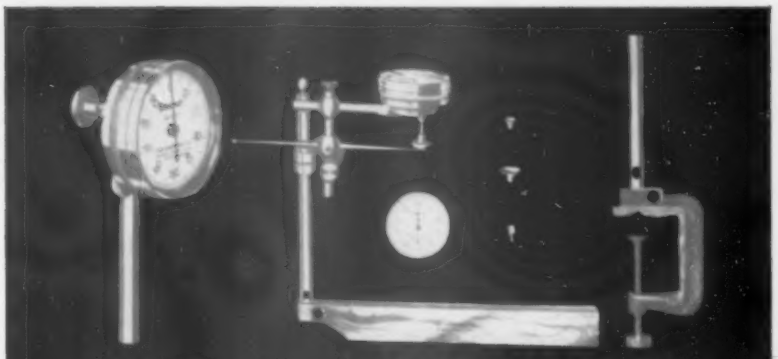

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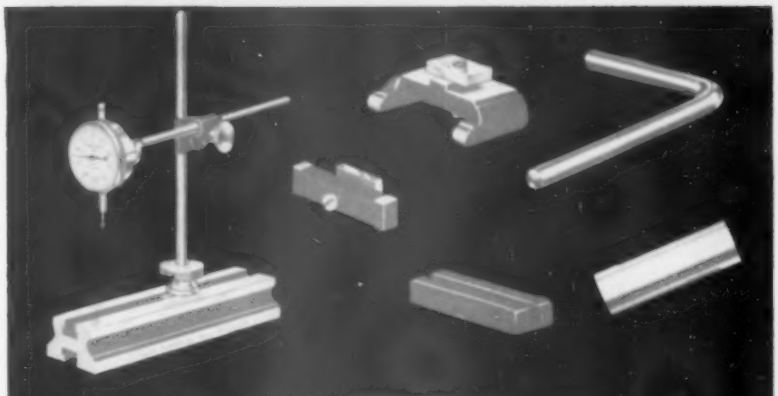

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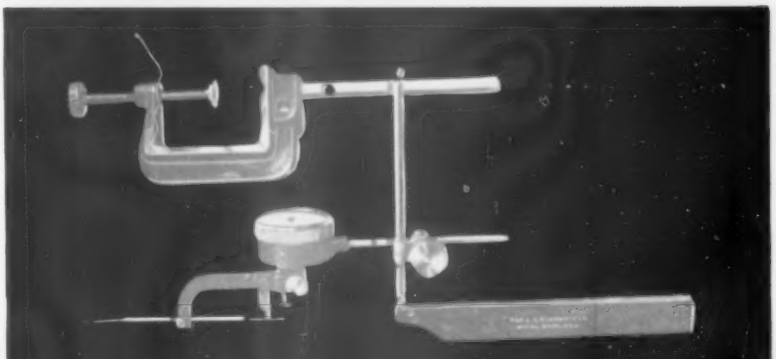

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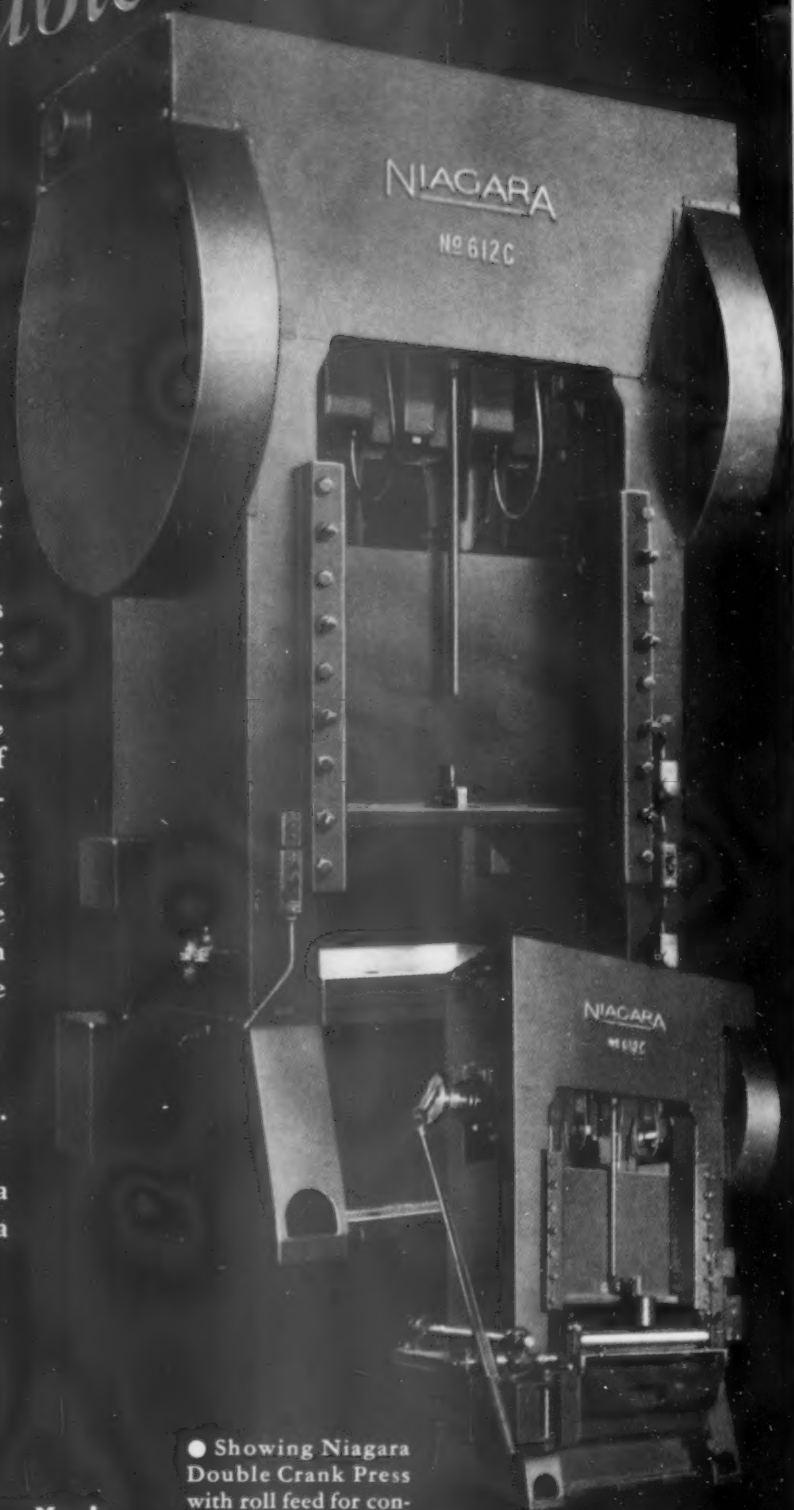

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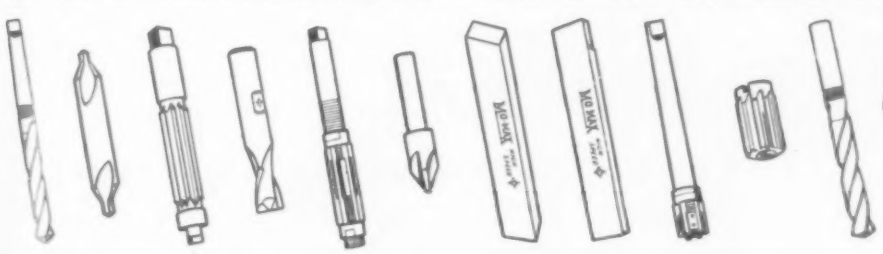

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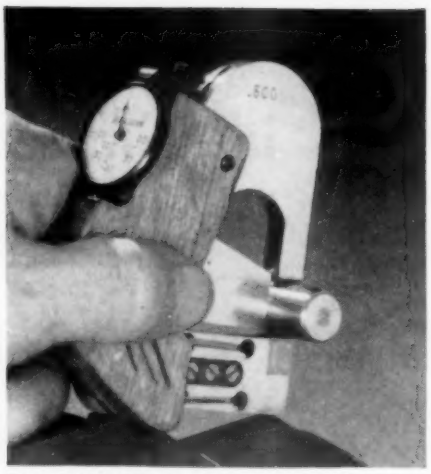

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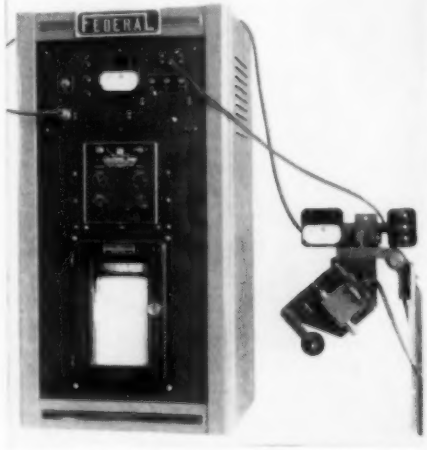

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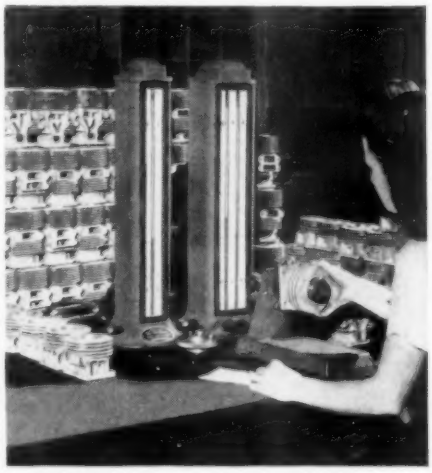

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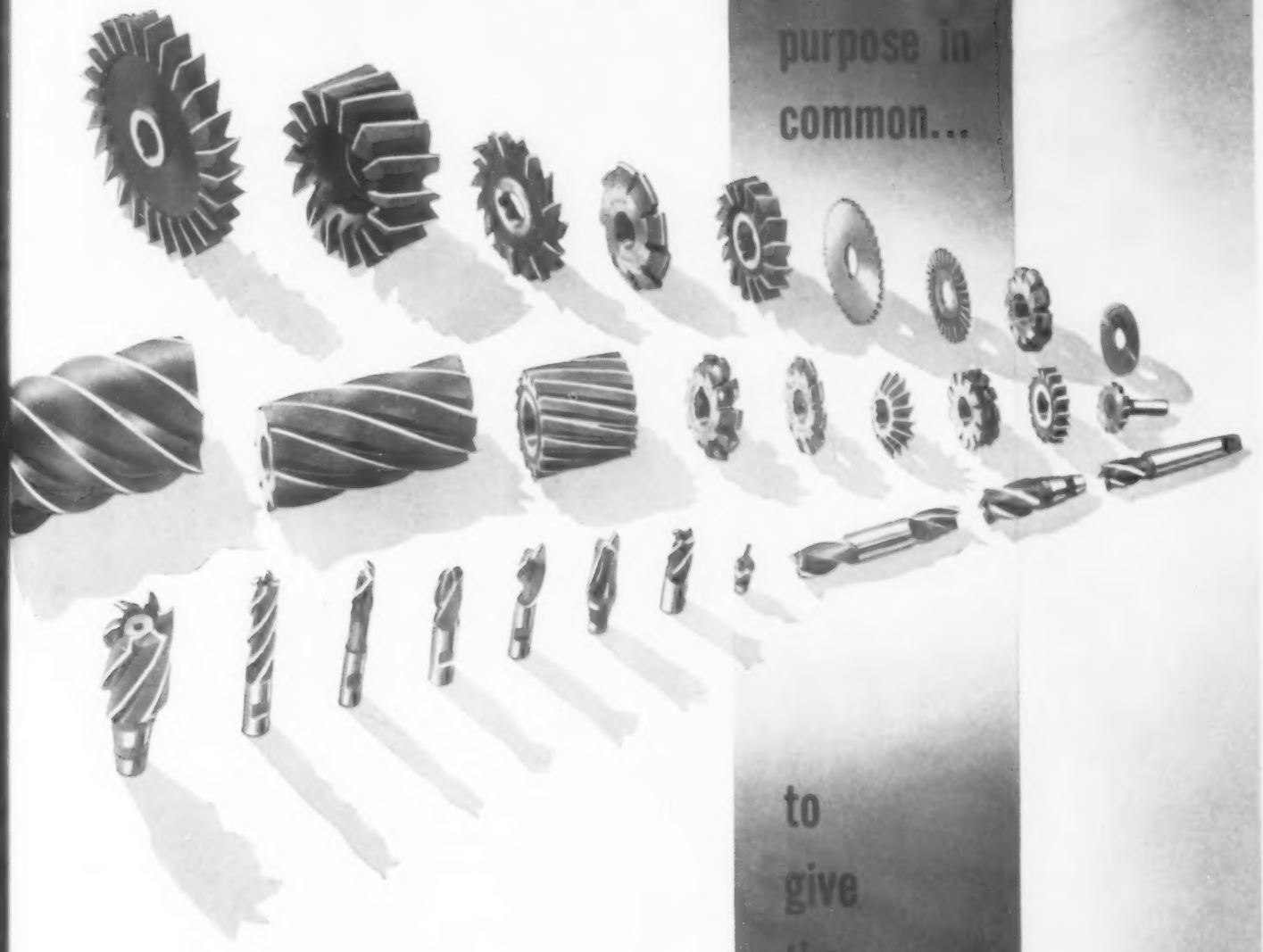

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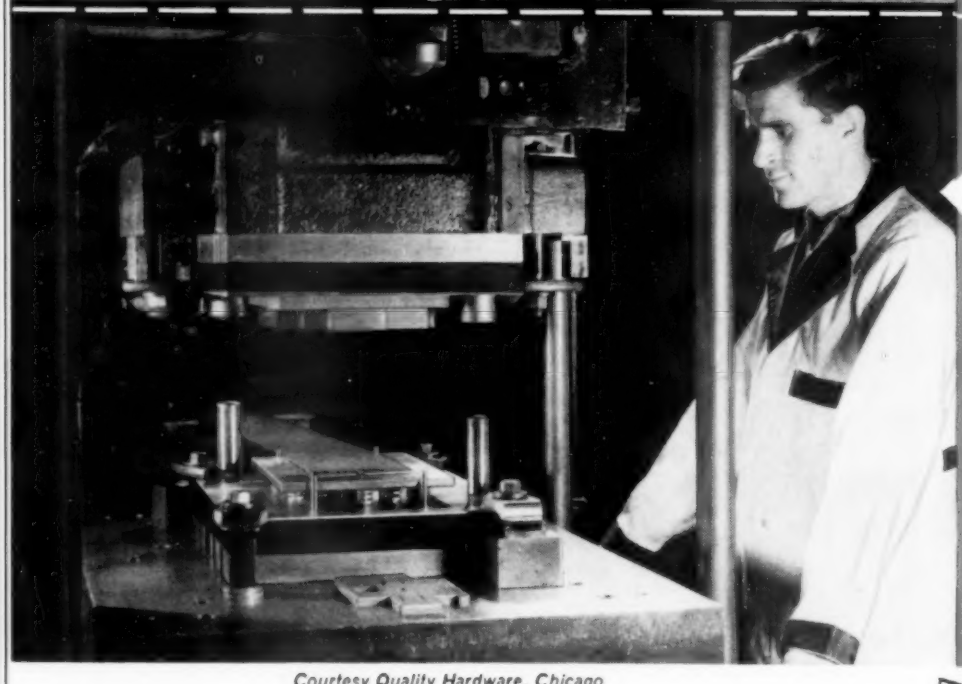

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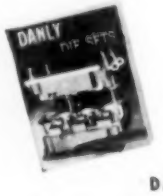

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Milling Hot Workpieces

By

A. O. Schmidt

RESEARCH ENGINEER
IN CHARGE OF METAL CUTTING RESEARCH

J. R. Roubik

LECTURER IN MECHANICS, MARQUETTE UNIVERSITY
AND RESEARCH DEPARTMENT

KEARNEY & TRECKER CORPORATION

BASICALLY, THE MACHINE tool is the inverse of a heat engine and is supplied with mechanical work which is converted into an equivalent amount of heat in the tool, chips, and workpiece. Therefore, the less heat the machine tool is required to produce, the easier the metal cutting operation becomes. (1)*

There are four different ways to machine heated workpieces:

1. Preheating the workpiece in the furnace and then machining it, meanwhile insulating or cooling the holding device so that not too much of the heat is transferred into the machine tool.

2. Machining workpieces while they are still hot from other manufacturing processes, for example, steel billets in a rolling mill** and forgings or castings*b before they have cooled to room temperature.

3. Heating the workpieces on the machine tool either by induction or with gas immediately before the cutting operation.

Lathe tests of this kind at work temperatures of 500, 1000, and 1500 deg F have been reported by Sam Tour and L. S. Fletcher. These workpiece temperatures were obtained by gas and induction heating (2).

4. Surface heating the workpiece on the machine for milling plane surfaces. In this operation the heat is applied to the top layer of the material and the machined surface is thus relatively unaffected by the heat.

When machining high-strength alloys at room temperatures more power is required in comparison to a similar cut in material of better machining properties. This means that the tool will reach high temperatures much more quickly and thus fail sooner when milling high-strength alloys. Fig. 1 illustrates how the hardness of the tool material will be affected by temperature. Even when machining a steel workpiece of about 200 Bhn the carbide tool will reach a temperature of 1500 deg F after a few seconds of cutting at 500 fpm (3). With increased cutting speeds on harder and stronger workpiece materials the tool will attain more quickly those temperatures at which its hardness will be lost and thus will no longer be able to perform satisfactorily.

There are two ways of avoiding high tool temperatures which cause a critical loss of hardness and cutting effectiveness. One method is to attempt to keep the tool temperatures sufficiently low with coolants, and the other is to reduce the cutting resistance of the workpiece.

When cutting fluids having good cooling qualities can be properly applied, they will usually increase the life of high-speed steel and cast alloy cutters by about 100 percent. Improvement in the life of carbide tools when the tool and workpiece can be completely flooded with an emulsion have also been experienced.

Coolants, however, cannot be expected to solve all difficult milling problems; different approaches to such problems sometimes have encouraging results.

For example, when a number of old die blocks used in drop forging required resurfacing, the cutting speed for the carbide milling cutter had to be reduced to about 100 fpm and the feed to 0.0035 in. per tooth. Only thus was it possible to obtain a satisfactory tool life of 12 passes, 24 in. long, 6 in. wide, and 0.250 in. deep with a 10-in. diam carbide face mill. At higher speeds and feeds the cutter failed quite frequently after only one or two passes. The machine used in these tests was a Kearney & Trecker CSM bed type machine of high accuracy and rigidity.

*Number in parenthesis refer to bibliography at the end of paper.
**U. S. Patent No. 2,387,553.
*bProposed by Mr. H. F. Scobie of "American Foundryman."

From a paper delivered before the Seventeenth Semi-annual meeting, ASTE, Oct. 28, 1949.

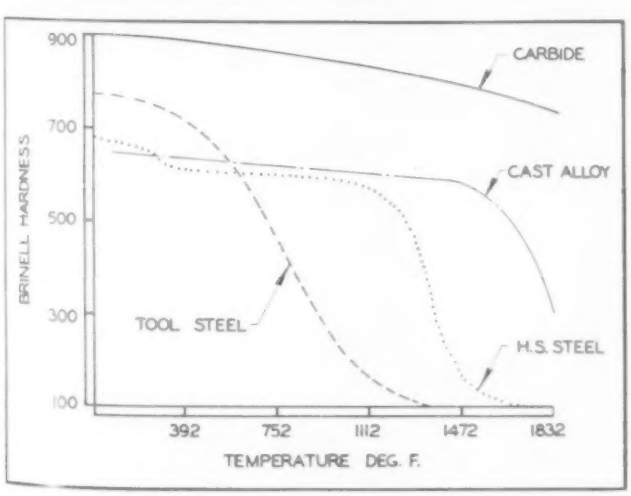


Fig. 1. Effect of temperature on hardness of tool material, based on data by E. Amman. Hardness of cast material estimated by performance in hot milling.

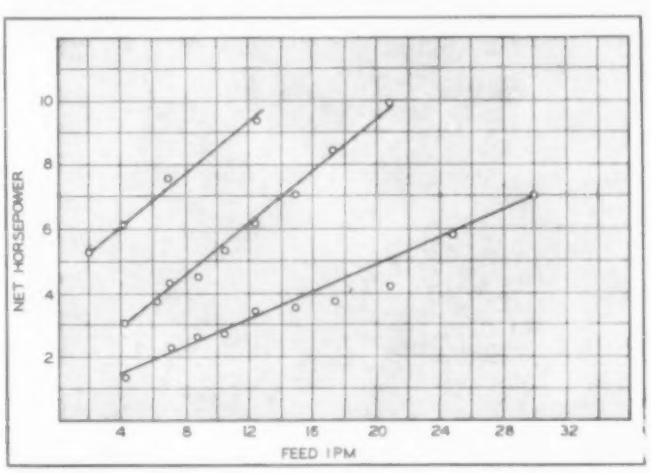


Fig. 2. Power required in milling a die block. Upper line indicates power to mill block "as received." Lower line shows power requirements when block was heated to 1500 deg F, while center line indicates requirements after block cooled to room temperature.

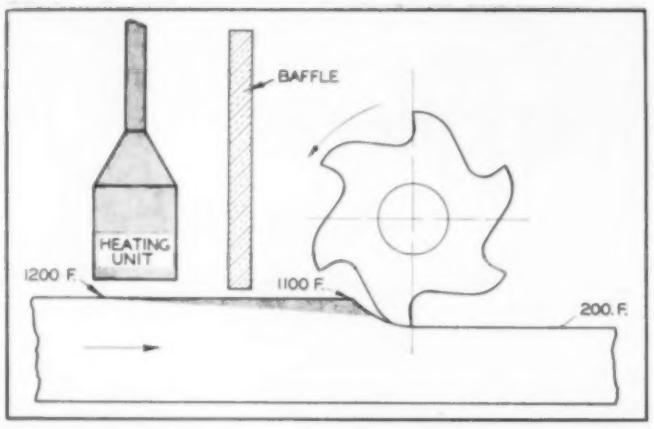


Fig. 3. Diagram of milling setup for heating the surface of workpiece. Shaded area indicates flow of heat.

The power requirements, as measured with a wattmeter, were very high. Another indication of the large amount of work required in this particular milling job was the high temperature of the chips, which would reach 1400 deg F, as determined by comparison of the chip with a heat-color chart.

In further machining tests the first method of hot machining was employed. One of the die blocks was heated in a furnace to 1800 deg F and then mounted in an insulated fixture on the milling machine table. The milling of this heated die block started when the block was at about 1500 deg F, as determined by comparison with a heat-color chart, and the temperature continued to drop slowly as the tests proceeded. The power required, measured with a wattmeter, is plotted as the lower line in Fig. 2. After the block had cooled to room temperature its hardness on the surface had dropped from an average of 400 Bhn to 350 Bhn, which also reduced the power needed as indicated by the middle line in Fig. 2. When the block was at room temperature in its original state, the power consumption was as shown by the upper line. (4)

Because of the intermittent cutter-workpiece contact inherent in milling, tool life is comparatively good when machining a heated workpiece, since the tooth is not in continuous contact with the work and has some chance to cool in the air between cuts. Changes in microstructure and accuracy in the workpiece are unavoidable when the entire workpiece has been preheated in a furnace but a difficult milling job can be made easier this way. Care should be taken to provide proper protection against the heat flow from the workpiece into the machine, either by insulating with layers of asbestos or by circulating a coolant in the table or fixture.

Preheating the workpiece means that the cutter will not be required to produce as much heat in cutting as when the workpiece is at room temperature. Instead of heating the chip material from room temperature to about 1400 deg F by deformation, compression, and friction attendant to normal cutting action, preheating the die block to the specified temperature will require a much smaller percentage of additional heat during the chip formation.

In tool-life tests on cutters with carbide tips, the same number of passes were completed when milling heated workpieces at high feed rates as when milling the same workpieces at room temperature at only one-eighth the feed rate.

A large number of slab milling tests using the fourth method listed before, were conducted on a Kearney & Trecker 1808 CSM bed type Simplex Machine, as well as on a knee-type Milling Machine. See Figs. 4 and 5. The cutter used was a Goddard & Goddard slab milling cutter 5 in. diam x 4 in. wide with eight teeth tipped with Tantung. The workpiece was a flat steel plate of SAE 4340, 280 Bhn, with the surface preheated by 3½ in. wide Airco water-cooled flat-surface torch. Pieces of asbestos board were used for insulation and for shielding the cutter and spindle nose. Before the table feed was engaged, the torch was lighted and the flame adjusted while the spindle was running. Feeds used in these tests were 50 and 60 ipm with a spindle speed of 180 rpm equivalent to 236 fpm cutting speed (5).

When milling plates of SAE 4340, ¾ in. wide and 24 in. long, about 60 pieces could be made with a H.S.S. cutter, 0.200 in. depth of cut, at a cutting speed of 90 fpm, and a feed of 6 ipm, flooding cutter and workpiece with an emulsion. See Fig. 6.

When these same pieces were cut by flame from a larger plate, the flame cut surface would air harden to such a degree that not even a cutter with cast alloy teeth could complete one pass. Using a single torch for preheating this surface as illustrated in Fig. 7, this machining operation was performed at feeds of 53 ipm and one section of the cutter would complete as many as 90 passes at a depth of cut of 0.200 in.

The heat supplied by the torch was sufficient to heat the surface of the workpiece in each case to around 1200 deg F. This softened the top layer of the material and cushioned the shock when the milling cutter tooth entered the work.

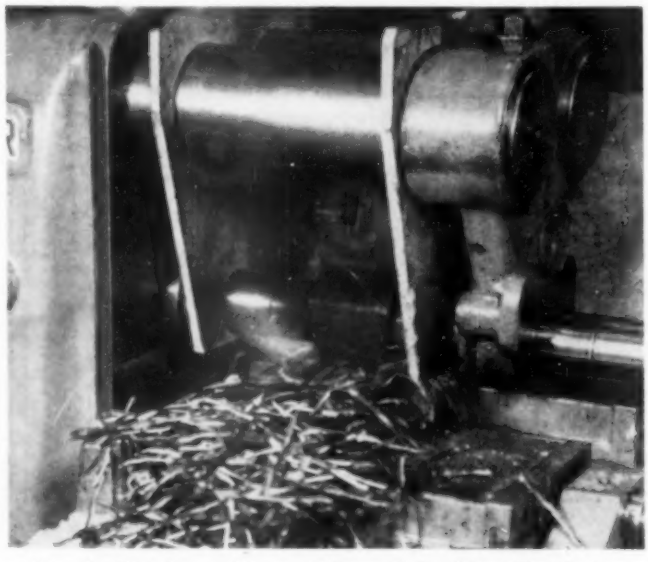


Fig. 4. Knee-type milling machine used in slab milling tests. Preheating of workpiece is done with gas surface torch, while the cutter and spindle are shielded by an asbestos plate.

Fig. 5. Milling preheated workpiece of SAE 4340 steel, 280 Bhn (Fig. 4) with eight-toothed Tantung slab mill. Cutting speed, 236 fpm; depth of cut, 0.2 in.; feed, 60 ipm; metal removal rate 48 cu in. per min; power required, 35 hp.

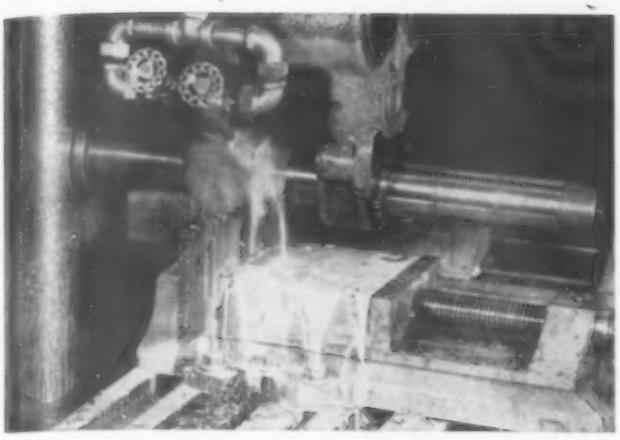


Fig. 6. Milling a workpiece of SAE 4340, 200 Bhn, with H.S.S. cutter. Coolant is emulsion of one part oil to 40 parts water.

Fig. 7. Preheating this previously-air-hardened surface permitted speeds of 53 ipm at a depth of 0.2 in., with high cutter life.

The temperature of the work surface at the point of engagement with the cutter, several inches away from the torch, was about 1100 deg F, as shown in Fig. 3. In addition, the power requirements were reduced as can be seen in the graphs, Figs. 8 and 9.

There was no discoloration or temper color on the milled surface, indicating that temperatures in the workpiece were below 350 deg F during the cut. A microscopic examination revealed no difference between the microstructure of a piece machined at room temperature and one machined with a preheated surface.

These numerous tests conducted with the workpieces heated on the milling machine with an oxyacetylene torch indicate that, because of reduced power consumption, milling is possible at greatly increased feeds. Higher production would justify the additional expense incurred in preheating the workpiece. When applying heat on the top surface of the workpiece, it was possible to control the heating in such a way that the impact blow between the cutter and work was reduced, the horsepower consumption lowered, and the rate of feed increased. Thus practically all of the heated material was cut out or removed in the form of chips. The workpiece and cutter were not too warm to be touched by hand immediately after the cut and no noticeable distortion of the workpiece could be detected.

As can be seen in Fig. 1, sintered carbide remains comparatively hard at high temperatures and will therefore mill a heated workpiece under conditions that will cause a high speed steel cutter to fail almost immediately. Many tests were also run with cutters having teeth of cast material. Judging by the good performance of cast materials, their hardness when milling a heated steel piece will approximate the line indicated in Fig. 1. Cast alloys prove to be satisfactory tool materials for use in hot milling, while H.S.S. cutters fail very quickly in such an operation.

Heating a steel workpiece will decrease the power requirements appreciably. Combined with intermittent cutting, an inherent characteristic of milling that results in tooth-workpiece contact for only a part of a cutter revolution, this practice yields good tool life. Carbides and cast alloys are suitable tool materials having desired properties at elevated temperatures, that is, they remain harder than the material they are cutting and can thus function as metal cutting tools. Cutters must be designed for good chip flow and immediate ejection of the chip to avoid unnecessary accumulation of heat in the cutter.

Hot milling, or milling a workpiece whose surface layer has been softened by the application of heat, quite obviously is not indicated as a desirable machining method when other, more established, procedures prove expedient. Application of this technique is at present limited to operations that cannot be performed practically or economically by the more common methods.

1. **"A Thermal Balance Method and Mechanical Investigation for Evaluating Machinability," A. O. Schmidt, W. W. Gilbert and O. W. Boston. Trans. ASME, Vol. 67, No. 4, May, 1945, pp. 225-232.**
2. **"Hot Spot Machining," Sam Tour and L. S. Fletcher, The Iron Age, Vol. 164, No. 3, July 21, 1949, pp. 72-77.**
3. **"Some Thermal Aspects of Metal Cutting," A. O. Schmidt and J. R. Roubik, The Tool Engineer, Vol. XXV, No. 5, Nov., 1948, pp. 20-23.**
4. **"Influence of Steel Hardness in Face Milling," J. B. Armitage and A. O. Schmidt, Trans. ASME, Vol. 71, No. 5, 1949, pp. 413-419.**
5. **"Hot Milling," A. O. Schmidt, The Iron Age, April 28, 1949, Vol. 163, No. 17, pp. 66-70.**

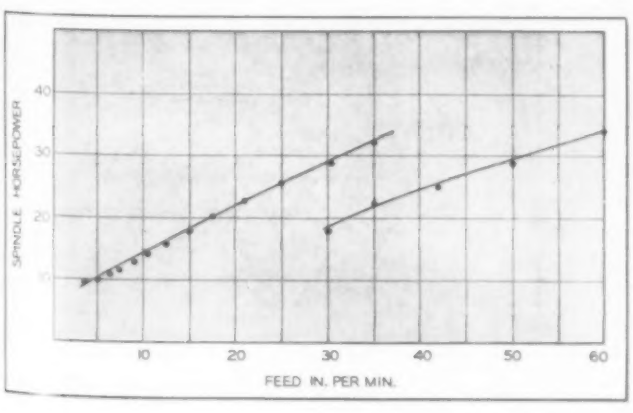
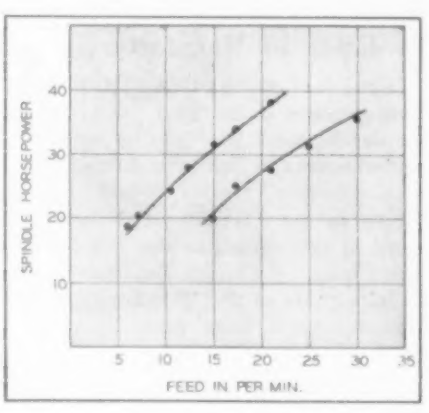


Fig. 8 (left). Relation between spindle hp and feed of milling machine. Lower line indicates preheated workpiece; upper line shows workpiece milled at room temperature. Depth of cut: 0.2 in. Fig. 9 (right). Relation between spindle speed and hp of milling machine with 0.380 in. depth of cut. Lower line indicates preheated workpiece; upper line shows workpiece at room temperature.



Limited Production

1-- Economics of Limited Production

By E. P. Blanchard
GENERAL SALES MANAGER, THE BULLARD COMPANY

IN MAKING THINGS, every good business is controlled by an accumulation of production costs. The success is measured in profits and the values of the goods produced are given in terms of price. Such money values, however, may be quite misleading, for we have recently seen how such values can vary. It is essential, then, to reduce commercial values to terms of a medium of exchange. But, even though the federal government compiles a census of manufacture which particularly expresses in dollars the value added by manufacture, we have yet, from an economic standpoint, to consider the intrinsic value of goods and how they serve their intended purposes. Economic value can easily be something very different, for the measured value of the form of stable goods used in a static way cannot in any sense compare with the dynamic values of tools and machines, measured in terms of their ability to produce and reproduce. We must, therefore, classify goods from the purpose and use angle, that is, as to whether, in any given form, they are raw material for a proposed process, or the means to promote the process directly or indirectly, or whether they are the product of the process.

Next, we may omit from further consideration the passive structural and service items in any plant of bricks, mortar, pipes, wires and conduits—all of which may contribute to or modify the product, but which do not have a dynamic effect upon it. The function of tool engineers requires that we deal with the active participants in the process of creating wealth, namely, the tools of manufacture, the machine equipment, and the facilities required to adapt the machine to its current purpose. These latter items represent commercial values that vary from the so-called long-time investment in machinery, even to the detailed, perishable tools that will be consumed on the job. Business accounting, attempting to express values in terms of cost or price, can never too closely approximate the economic impact of such goods. The economic value of a machine may vary by the product that it is set to produce. With considerable money invested in the equipment, it may be obsoleted by any effect from progressive science to a passing fad before its investment has begun to be absorbed in the product it has produced.

Evolution of Manufacturing

The job of making things dates from the origin of civilization; perhaps is the origin of civilization, and the story of its development through the ages has been told in several picturesque and fantastic forms. The first real consciousness, however, of this science was formulated by Adam Smith in his "Wealth of Nations" which was published early in the industrial era. This was followed up 50 to 60 years later by Charles Babbage in his book which made a definite study of the "Economics of Manufacture", at which time the contribution made by tools had become so prominent a part of civilized progress and had so seriously affected all other factors, that recognition, analysis, and formulation of the science could no longer be avoided.

Picture now, if you will, that first man at the dawn of civilization acquiring by necessity the rudiments of living, doing, making things. His tools were a stick or a club, and a stone and, when he first fastened the stone to the stick and created a hammer, it was a world-shattering invention as well as a skull-shattering creation. Let us place him at the bottom of a long vertical line that will measure his climb to the ultimate of achievement. The measure of this line marks the work required of man without tools and is properly shown as a minus value, 1. Then, as time moves up toward the present time, picture the line of progress moving gradually away from the vertical (See Fig. 1), forward to the right by the invention and use of tools and machinery to improve the conditions of living and to promote civilization until, theoretically, in the ultimate infinity, man's contribution of work to the creative unit need be nothing and the machine factor is the whole value, 1.

The Economics of Limited Production confine our present study to a section of this line of progress where the values of X and Y in Fig. 1, empirical though they may be, are best related in current cost-accounting factors for the production of a given limited quantity of work.

We can now proceed to identify the significant economic

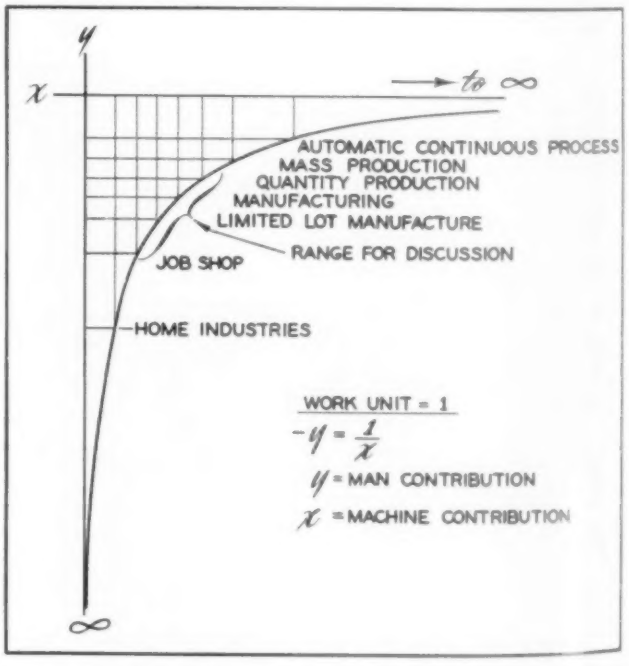


Fig. 1. The ascendancy of industry, production and civilization.

From a paper delivered before the Seventeenth Semi-annual meeting, ASTE, Oct. 28, 1949.

factors and to measure their effect on the process of manufacture. It is the tool engineer's problem to be sure that for a given quantity, the process has been refined to the highest point and greatest economy in apportioning the use of tools and labor as justified by the optimum in manufacturing cost for the value created.

Defining the Quantity

But first, the quantity. The present problem specifies Limited Quantity. It is advisable to investigate how such figure was set and how rigidly set, whether by contract, by sales volume experienced or prognosticated, by conditions that dictate just this quantity or with percentage of variation allowed, or is the quantity subject to broader interpretations such as "how often does the requirement repeat and can lots be combined?"

The next important point, obvious in any given project, but which must be mentioned for consideration, is the determination of what this undertaking is to be. Is it to be a small (and how small) single-product business, or a multiproduct project; is it part of other operations, intermittent in a job shop, or is it a recurring or even a continuous process as a part of a general manufacturing plant? Such considerations will have a significant effect in determining the equipment and the equipment factors affecting cost. Is the equipment at hand obsolete or worn out, so that tooling must incorporate facilities to assure the accuracy and quality of the product, or can the machines be depended upon for their inherent accuracy and thus permit simpler tooling? Those projects where new equipment may be bought for a specific purpose are "carte blanc-Elysium" for the tool engineer.

It is probably not necessary to present herewith an extended discussion of the economic factors in such various conditions as outlined, but it is worth noting that the acceptance of what appears to be the lowest cost per lot may be at times, quite far from good overall business economy. For instance, in the typical conditions found in a run-down alley shop where the boss works with a few men and has little or no overhead or investment burden, the actual production cost generally accumulates at a faster rate per unit because of inefficient tools. This is literally the cheaper method for smaller quantities until the direct cost accumulated per piece equals and exceeds a cost based on a reasonable investment in proper equipment (Fig. 2, Line B) but which, with a lower accumulated cost per unit, finally crosses the alley shop line A at a break-even point.

The most important economic factor and perhaps the most controversial on many points is this subject of equipment. This includes the machine and tool investment indicated for any specific project, as well as the handling of the costs incurred by its use. What we primarily seek is that higher degree of refinement in machines and tools which is conducive to higher performance standards and relieves the human factors, but under which the investment can still be justified by the economy of quantity. Any production engineer would recognize that the economy of method is not a smooth reducing curve inverse to the increasing quantity, but usually consists of deliberate steps in modification of method, in which case even the quantity justifying the steps is only approximate. It is a matter of good economy, however, to adopt a method justified for a considerably greater quantity, but where the virtue of saving is not lost even for lower quantities within the same range.

Investment and Final Cost

Wherever refinement of equipment can be justified, it carries not only the advantage of economy in manufacturing cost, but improves the human factor and the social and economic conditions affecting the enterprise itself and, most significant, adds appreciably to the national economic potential. Very often such values are way beyond the money value of the equipment itself. It might also be remarked that impersonal machine facilities are much more easily managed than man's ability and skill.

The economic residuary value in equipment, however, brings up the question of investment and the charges which are apportioned to job costs. This phase has to do with actual deterioration and obsolescence in machines and methods, and the conflicting policies of entrepreneurs, economists, accountants, and taxhounds regarding depreciation allowances. The recurring charges for such equipment, arbitrarily applied to the cost of the product, are important to the accounting determination of profit and loss, but there is a more critical significance apparent from an economic point of view. The wise conclusions will be the same whether considered in relation to the problem of limited production, or whether applied as a policy on a national scale for the establishment of an economic potential for the emergency of national defense, or even if applied to maintain a progressive economic equity. Under presentday conditions, the progressive policy with regard to machine investment is a most important factor in national economy to support a standard of living that avoids political turmoil. There are real problems in many countries today where controlling policies have destroyed the incentive to invest in production equipment

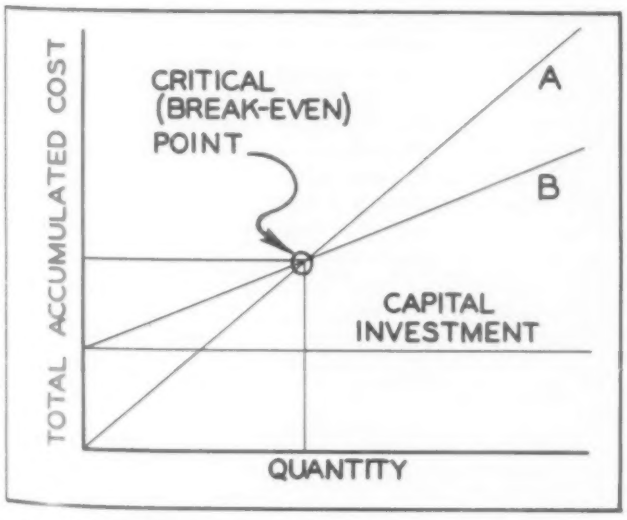


Fig. 2. The break-even point, in terms of capital investment, quantity and total accumulated cost.

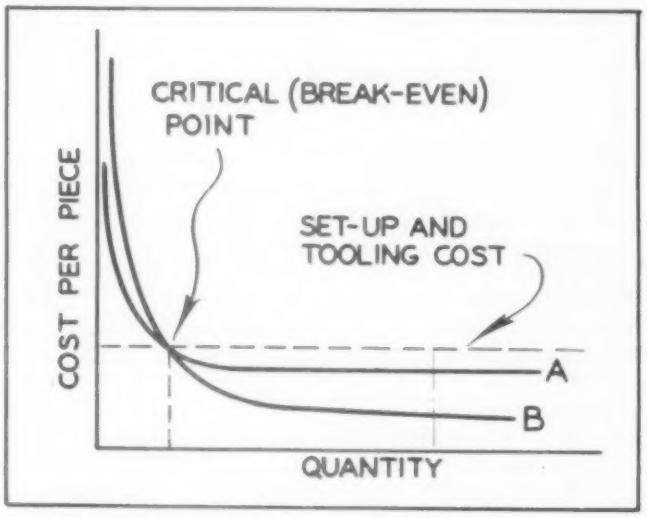


Fig. 3. Evaluating the break-even point further in terms of quantity, cost per piece, plus set-up and tooling cost.

and to produce goods at a profit, and the national attitude is reduced to a mere dogged struggle for survival.

It should be clear that while some conditions impose restraint on investment in production equipment, it is also clear that it is safer, and even more conservative, to err on the plus side. The price of investing in equipment for methods encompassing a somewhat higher degree of refinement than cost analysis shows is justified will often repay in extra advantages not evident in cost. The policy is good so long as it is not overdone to the point of diminishing returns. Many tool engineers have known of actual cases where equipment intended for far greater quantities of production has been applied even on a part-time basis to limited quantities and in the end has proved, in actual cost figures, to be the more economical way. It is surprising how few pieces per manufacturing lot will absorb the attendant costs of machine set-up and tooling, due to the shorter production cycle and the much lower direct cost. (See Fig. 3, where lines A and B have the same meaning as in Fig. 2.)

In presenting this philosophy of limited production, we have been using charts more as diagrammatic pictures to put over a point than as analytical curves with attached values of mathematical formulas. Practical formulas for simple unit cost comparison, however, are extremely useful. They can clearly demonstrate on a cost basis how far to refine equipment in order to take the optimum advantage of any given quantity, but they must not be taken as final guides from an economic basis, for there are several other factors unrepresented which must yet be left to individual judgment. At an earlier stage, we indicated that economic value could not be measured in manufacturing cost. In all investment for producing equipment, there is an unearned increment in economic values which, on a dollar-and-cents basis, has been figured time and again to a formula, and which shows that a good investment in production equipment can return its value in a minimum of two years, sometimes sooner, but which must, at a maximum, be not more than five or six years.

2--Tools, Materials and Methods for Limited Production

By J. B. Savits

METHODS MANAGER
PNEUMATIC SCALE CORPORATION, LTD.

STATISTICIANS HAVE indicated that our industry as a whole is composed of a large number of small or medium shops with from 10 to 500 people. The very large corporations involve a numerical minority. We shall deal with the small machine shop with anywhere from 50 to 500 men, and discuss the necessity for producing their components to the highest standards that can be obtained, quickly and cheaply.

By far the most important element at our command is *Methods or Planning the Job;* its working tool is the *Operation Sheet* which solidifies the applied thought in *advance* of release for manufacture, and determines the importance of selecting the initial working points.

The dictionary definition of Methods Engineering is given as "The technique that subjects each operation of any piece of work to close analysis, in order to eliminate any unnecessary operation, in order to approach the quickest and best method of performing each necessary operation."

We paraphrase that by giving you our own definition: "The manufacture of a part from the most readily available materials, in the shortest number of moves consistent with the equipment available, with a minimum of special tools, to the highest degree of perfection attainable." Or more briefly, "Taking the skill out of the job."

Importance of Operating Forms

Primarily, the breakdown is made of each operation so that it can be performed on and with the equipment at our command; designating correct locating surfaces so that succeeding operations can be performed accurately; addition of identifying symbols to the tracing which agree with instructions on the operation sheet; references to specific tools needed for the job; identification of all loose parts needed for such tools.

Do not forget that the part drawing is the master specification and the operation sheet is the specification for maintaining order and quality in production. Whatever else we do is but an effort to clarify the drawing so that the man at the bench or machine can devote his whole time to production units, without wondering or wandering.

Operation sheet forms must be simple, and the wording concise, brief, and very much to the point. Superfluous wordage is a detriment. Material specifications must be in full detail. Knowing the quantity is essential for determining the most appropriate method.

To review briefly what we accomplish by this method, the operation sheet

1. tells the whole story for each part.
2. permits preceding and succeeding operations to be studied.
3. sets up a standardized method for similar parts.
4. trains the operator to follow the standard method.
5. minimizes the amount of supervision required.
6. sets a basis for production control.
7. determines the basis for quality control.
8. establishes specifications for incentive rates.
9. indicates changes for easy identification.
10. invites suggestions for improvement.

Complete understanding of the problems of the engineering staff is an absolute must. A mutual respect is needed between the designer who knows what he is trying to achieve and the engineer charged with interpreting the drawing so it can be carried to completion. Unless that mutual respect for each other's problems is evident, there is the ever present danger of a product below standard, dissatisfied individuals and ultimately defective parts.

It might be considered heresy in a tool engineer, but the whole effort at our own plant, which is a typical New England shop producing some 90 different machines in the high-speed automatic packaging, bottling and labeling field, is concerned with elimination of the necessity for special tools.

In common with many of you, we have a fairly large tool crib wherein are kept the sundry jigs, milling and lathe fixtures, and an assortment of reamers, plug gages and cutting tools. Our problem was the reduction and elimination if possible of all the *special* one-job tools, kept in storage,

eating up usable space and costly taxes, involving both clerical and mechanical manpower to keep track of such tools, and to keep them in repair.

The largest, heaviest and costliest were the milling fixtures. We have made but few new ones and discarded many others made in the past forty years, by the simple expedient of casting tooling pads as an integral part of the basic design, or placing them where they can be readily cut off by a Do-All saw to blend with the original outlines. These pads serve to bring faces in line for Blanchard grinding, also as supports for planing and drilling.

More than anything else, our foundry casting problems are greatly reduced, since many of these pads are large and sturdy enough to act as aids in gating and risering so that the shrink takes place *outside* the actual limits of the casting. Our cast parts are so designed that they can be held between parallel faces, clamped against tables or face plates, or held in lathe jaws either circular or rectangular, with an absolute minimum of shimming. Tooling pads can be removed for a fraction of the cost of even the cheapest fixture you can construct.

Drill jigs are an unwarranted expense for the exact duplication of holes in large quantities. Even then it may be cheaper by far to bore a few of the important locations, accurate hole sizes or gear distances, then lay out the rest or make sheet metal spotting templets. We cast "spots" if tolerances allow. The new Manautrol type of attachment for radial drills and boring mills eliminates the necessity for jigging by using a system of stops to predetermined charts.

Circular jigs for radial holes were a great problem; that is, until we compiled a record of all those made in the past; discarded many; checked, bored and bushed others, and finally standardized the radial distances for each jig. These are usually made with a 1-in. center hole, making it necessary only to make a stud or bushing to fit the special case needed. Drawings are checked to our jig list before release for manufacture, and it is seldom necessary for us to make a new jig.

Lathe fixtures are seldom required, with the possible exception of a few bored jaws for some special jigs, or perhaps an inexpensive series of clamps which can be used for other parts. Holes or cored slots, previously incorporated in the design, can be of immeasurable help in reducing the need for special holding devices.

Most vexing of problems were the special-diameter holes. Time was not too long ago when the designer called for a "special fit." Usually the "fit" took place in our shop when the boys were called upon to make the parts.

We compiled a list of special reamers, plug gages and arbors already in existence. Rigid check is now maintained so that no new sizes are added without just cause. Designers are furnished with duplicate lists and can usually find the right size for their purpose. No new sizes of any consequence have been added for several years past. In short, we use hole diameters obtainable with standard tools to cut down the cost of special tools.

Select Standard Material

Tolerances are another headache. Do not specify anything closer than it needs to be. Extra supervision, costly tooling, and constant tool and machine resettings can be reduced by a sane approach to the needs of each case.

Special threads mean special tools, thread-gages and close inspection. It is seldom wise to depart from the Standard National Coarse and National Fine Threads, which are satisfactory in most cases.

A cardinal rule has always been to select the most easily machined material consistent with the needed requirements of strength, wear or corrosion resistance, on the premise that poor machinability shortens tool life and increases downtime. Resultant finishes, if poor, mean extra work in refinishing or some other form of special treatment. While we adhere to that principle, there are many departures from that rule which saved us thousands of dollars.

Practically all our mild steel round bars are produced for us cold-drawn and stress relieved, and to standard tolerances in most cases. Several sizes are carried in 3 tolerances: minus 0.001-.002 in.; plus or minus 0.0005 in., and plus 0.0005-in. plus 0.0015-in. This distribution of selected sizes throughout our range of parts saves many man hours of filing time. Extra cost of size selection in cents per pound is far below the astronomical cost of filing or grinding oversize stock.

With the cooperation of the steel producers, we are also using this material just 0.020 in. over the nominal size desired, starting at $\frac{5}{8}$ in. or 0.625 in. diameter and progressing to 3.020 in. Turned ends are left this same 0.020 in. oversize.

We have a large number of multi-diameter shafts which must be ground to maintain concentricity. These previously were made from a hot-rolled mild steel $\frac{1}{8}$ in. larger in diameter, rough turned, straightened and finally ground. It is obvious what stresses a single-point tool can place into a long shaft of small diameter.

Reducing Heat Treating Costs

The extra cost per pound of cold-finished steels over that of the hot-rolled material is more than offset by the decreased weight involved; by less wear on lathe collets and the preservation of their accuracy; by the elimination of induced stresses, straightening and excess handling. Shafts are produced speedily and economically, and are excellent quality. Incidentally, this grade of steel is free-machining, can be cyanided, salt-bathed, case-carburized or welded. In the smaller diameters it will flatten cold and take a fairly sharp bend without annealing beforehand.

Medium-carbon steels of the SAE 1045 type can be readily machined, then flame or induction hardened 1/32 in. or 1/16 in. deep. This method is quite economical since grinding of the hole is unnecessary as would be the case if the part were case carburized; and distortion is kept to a minimum.

Elimination of troublesome heat-treating after machining is an accomplished fact with us. We purchase all heat-treated alloy steels to a definite Rockwell hardness, maintaining rigid inspection and identification procedures at our steel stores *before* the material is stacked. Decarburized threads, and lack of uniformity in size or hardness are a thing of the past. We are not so much concerned with the analysis as with the physical properties, and the selection of available steels is much wider. Still tougher steels will be used when the shop can conveniently machine them.

Nitriding steels are supplied to us *re-heat* treated to our specifications in the bar *before* any machining. This has eliminated much rough machining and enabled us to produce an expensive train of bevel gears at tremendous savings. This is an advance of immeasurable importance, propounded to and agreed to by Dr. V. O. Homerberg, who pioneered Nitralloy.

Abrasion resistant steels in sheet form, can be adapted for many uses. They are most always used "as rolled." We have successfully flame hardened this material to a depth of half an inch in a very interesting application.

Drilling of two 5/16-in. diam. holes to a depth of 11 in. in heat-treated aluminum was a problem. These had been machined in a boring mill at 180 minutes per pair, with the attendant difficulty of maintaining the bores straight and parallel. Purchase of a deep hole driller solved the problem. Both holes are now machined in approximately 30 minutes.

As a result, while methods were not necessarily in accord with accepted practice, the desired results were obtained.

3--Quality Control of Limited Production

By C. D. Wright

CHIEF ENGINEER
RELIABLE TOY COMPANY, LTD.

WE KNOW THAT it is possible to determine all dimensions by direct measurement using scale and caliper, micrometers, gage blocks or measuring machines. We also know that we can determine within limits the same dimensions by gages and inspection methods and equipment. Further, it is possible to reduce defect and unnecessary variability in process factors by the use of statistical techniques. As we increase the degree of inspection and control of process, we are making an investment in gages, equipment and organizational setup which presupposes certain savings will be made.

This paper will discuss the elements affecting value of quality and cost of quality as applied to limited production, rather than the mechanics of the individual methods.

Quoting from the Tool Engineers Handbook[1]:

> "Since the attainment of perfection in quality is a practical impossibility, the cost of perfection is theoretically infinite. However, the value of quality is always finite as determined by the trade. Therefore, in planning toward perfection, the value of quality is so low as to make the part worthless, there still remains the cost of raw material and some labor, so that even when the value of quality is zero, the cost of quality is appreciable."

Further, a type of specification which relates quality to margin of profit is poor control, since a large margin of profit encourages poor manufacture and too small a margin of profit will interfere with production of good quality.

Determination of Quality

The purpose of inspection on every manufactured product is to determine by examination whether it meets previously chosen standards of quality. It customarily includes visual methods supplemented when necessary by numerous devices such as gages, and measuring means such as comparators and optical flats. It also includes, when required, investigation of quantity, size, volume, weight, construction, color, surface imperfection or completeness of manufacture. Inspection is generally performed after manufacture, for the purpose of acceptance or rejection of the unit piece or lot. The report instrument is also used for transfers of quantities of material or parts which pass from one operation to another. This also serves as inventory control information for the material control department, as well as a basis for payment to workers who are on an incentive basis.

Further objectives are obtained by process inspection, which is concerned with control of quality during manufacture. This includes uniformity of product, detecting changes in product due to process trouble before it is transferred to a serious stage, and the resultant economic effect on attaining the best and the most for the least effort.

In any quality control and inspection service in industry, the volume and nature of the product, together with local conditions will have an effect on the extent to which the following methods are utilized:

1. System of fits and limits.
2. Gaging system.
3. Inspection methods and equipment.
4. Extent of inspection organization and responsibilities in:
   a. receiving inspection.
   b. floor and centralized inspection.
   c. first-piece and patrol inspection.
   d. statistical or control-chart method.
   e. lot-by-lot sampling.

The whole subject of inspection equipment and methods is closely allied with the interchangeability of parts, the essence of mass production. As applied to manufacturing, the term "interchangeable" means that the various parts of a mechanism are accurate enough to function properly and sufficiently uniform in size and shape to fit or assemble in any of the machines of a lot or series, for which the part is intended.

To achieve either interchangeability or selective assembly it is necessary to establish a suitable system of allowances and tolerances. A limit system provides the most reliable way of obtaining the manufacture of interchangeable parts with maximum economy of production.

This is accomplished by—

1. **Specification** by the product designer of the limits on parts drawings, consistent with good design.
2. **Provision,** by the tool designer, of the necessary jigs, fixtures, tools and gaging system to produce and inspect the parts in accordance with the specified limits.
3. **Tools and gages** designed or set up so as to enable operators of average skill to produce parts within the specified limits.
4. **Inspectors** of requisite ability and equipped with suitable gages or other means for rapid and accurate inspection to accept satisfactory parts and reject unsatisfactory parts. With such a suitable limit system, which permits the largest tolerances possible consistent with the proper functioning of the assembled mechanism, the manufacturing time and the assembly time are kept to a minimum. This facilitates service on repairs and replacements.

To apply a system of gages and gaging satisfactorily, the following conditions must exist:

1. Coordination of component dimension limits to prevent excessive or insufficient clearance, resulting from a succession of improperly applied tolerances during the process of manufacture.
2. Coordination of particular gages with reference to fixture-locating systems.
3. Establishment of amount of intentional difference between work, inspection and reference gages.
4. Establishment of definite wear allowance and gagemakers' tolerance.
5. Material to be inspected and inspection frequency in relation to material from which the gage is made.
6. Control of work, inspection and reference gages.
7. Also, the cost of the gaging device or method should be considered in relation to the volume of manufacture and type of product.

[1]First edition, compiled by American Society of Tool Engineers, McGraw-Hill Book Co., Inc., New York, 1949.

The specification of the limit system on the product drawings is not the responsibility of the tool engineering and inspection department, but they are concerned with the application because of its effect on the inspection methods and equipment. It is considered good policy not to differentiate between the amount of product design effort and attention on a limited-production order, and that expended on a large-volume run.

Gaging in Limited Production

A difference is made, however, on the extent of gaging system, process sheets and operation instruction for limited production. First, the volume and nature of the product will determine whether work, inspection or reference gages are required. Generally, one set of gages, the inspection gages, will be sufficient, provided that the gages are available to operator and inspector. Economies can be made in the gaging program by providing standardized parts such as adjustable limit snap A.G.D. gages, gage handles or dial indicators, that can be re-used for other programs. Also, the number of gages can be reduced by letting the jigs determine the part accuracy. Ingenuity on the part of the designer can be used in applying principles of measurements over balls and pins for special surfaces rather than expensive gages.

Secondly, it might be advisable to eliminate wear allowances on the gages and provide only gage makers' tolerance. As far as process sheets and operation instructions are concerned, it would depend to what extent these are used in the planning and estimating stage. If the information has been compiled in an orderly manner, there is no advantage in keeping it a secret from the shop. The only difference need be in the refinement. As an example, a manufacturer of air compressors may make only fifty machines of a particular capacity and yet, through service requirements, establish a limit system comparable to automotive mass production. On the other hand a simple gaging system and a limited number of gages could be sufficient, since it might be economical to determine some dimensions by direct measurement, rather than by the use of limit gages. In other words, if the time and material required to impart the dimensional accuracy to a gage or gaging device is exceeded by the total time needed to determine the measurements of the total run by direct methods, it might be economical to inspect by direct measurement. The possibility of repeat orders would, of course, have to be considered in deciding the extent of gaging expenditures. The individual inspection skill has a direct influence on manual gaging.

Departmental Organization

Inspection equipment and responsibility are generally related to the method of manufacture and line organization.

In the ideal organization for inspection, the function is controlled by a separate unit in the manufacturing division; such unit is independent of any shop or engineering control.

If the foreman has control of inspection, quality may be affected in order to maintain operating standards. Objections are also evident where the inspection function is the responsibility of the engineering department, such as the case where engineering shortcomings are responsible for poor quality standards, and the causes are not general knowledge. At the other extreme is the objectionable continued redesign for perfection of quality, at the expense of "freezing" the design and retarding release for manufacturing.

A general shifting of inspection responsibilities is required for limited production. The governing factors would be: inherent inspection organization, degree of operator skill, and the nature and functional requirements of the product. In some cases a skilled operator is the inspector, not only for limited production, but also on some operations such as on automatic screw machines. Whatever division of responsibility is made, it is important that the authority be clearly defined and understood. Whether the inspection function is the responsibility of the foreman, or an inspector is provided, it is important that close cooperation be maintained with the engineering departments in order to obtain maximum advantage of their respective and combined experiences.

Engineering changes are often advantageously made, due to an inspection report of abnormal rejections on too exacting a specification. Similarly, requests for engineering change should be made by the tool engineer, during the tooling stage, on re-dimensioning and allocation of tolerances, to better suit the part function or part fabrication.

The time spent in discussing inspection methods and equipment with foreman and inspectors, prior to ordering gages, is a good investment. This is especially important on limited production, since needless expense can be eliminated in design time, gagemaking time, and material and inspection procedure.

One or more of these methods may be used in a particular organization. The scope will range from receiving inspection through all stages of parts manufacture to the completed item.

Sampling and Inspection

A combination is generally made of floor and centralized inspection on all types of products. The disadvantage attending floor inspection, that of having finished work accumulate at the work station, is often overcome by the advantages of finding errors before the lot is completed, and of the reduction of material handling in moving parts to a central inspection area. A degree of central inspection may be necessary where specialized inspection equipment is not located conveniently to the machine, or where it is not necessary to maintain flow of work by product layout. Again quoting and adapting from statements in the Tool Engineers Handbook, relative to inspection methods and their ease of application and cost of administration:

> "The first-piece and patrol inspection method is particularly useful where production is on a job-shop basis, runs are short, and kinds of parts change from order to order. This method of inspecting one or more pieces at the beginning of a run or shift to determine machine setup, may be made on any production where more than two units are to be made. Units or parts produced before first-piece inspection, should be inspected 100 percent. The frequency of patrol or subsequent inspection will be determined by such factors as tolerances, operator skill and attitude, tool wear, and ability of the tool to consistently reproduce parts of the desired quality."

Pilot piece inspection is a further stage of first-piece and patrol, and is confined mainly to process layout of equipment, since it consists of running a part through its complete sequence of operations on the production line.

Lot-by-lot sampling is often performed by inspecting random samples from a lot, the entire lot being either completely accepted or rejected, depending on acceptance of samples. The lot-by-lot sampling method is also performed by the control chart method and places more responsibility for quality of product on the line of personnel, which is a desirable feature in a production organization.

The statistical or control chart method is effectively used on long runs, such as continuous process, or where tools are used which inherently control the dimensional characteristics, such as form tools and broaches. These are not limitations, however, since benefits can be obtained on any production operation by emphasizing economic and orderly thinking about cause and effect, through observation, interpretation and action.

Mold Dies

1. Mold Die Hobbing

By

Islyn Thomas
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MOLD DIE HOBBING is a specialized phase of mold making, known in some manufacturing centers as "hubbing". The operation (Fig. 1) consists of sinking a properly hardened and highly polished steel master (the "hob" or "hub") into a piece of relatively soft metal, under heavy hydraulic pressure.

When the push is completed and the hob is withdrawn, the cavity produced in the steel blank is as highly polished as the hob itself. The pores of the steel are greatly reduced in size, with a resultant fine-grained cavity surface.

A number of factors must be considered before deciding whether to hob a mold die cavity, or to resort to machining with its necessity of filing and stoning out the tool marks. The design of some parts will call for bosses, shoulders, thin sections, and undercuts which would make the hobbing method difficult to impossible. On the other hand, hobbing may be clearly the better method when large or multiple cavities are to be produced; when high uniformity and surface quality is required in the cavities. Sometimes hobbing will be the only practical method, as when the dies are to have raised letters, numerals, or other designs. In some cases, a combination of hobbing and machining will be the best solution.

Selecting the Hob

The hob is the steel master form by means of which the exact desired shape of the molded product is impressed in the cavity; in other words, a replica of the part to be molded.

Good hob design calls for elimination of sharp corners by use of as many fillets as possible; use of largest permissible draft or taper, preferably a minimum of 0.010 inch per inch of side; no undercuts; highly polished surfaces. The hob and resultant part illustrated in Fig. 4, are representative of hobbing practice today.

Among the metallurgical and physical considerations in selecting a satisfactory hob steel are compression strength, combined high hardness with toughness, hardness depth, minimum hardening shrinkage, and the machining characteristics. A good average hob steel, for oil hardening, contains: 0.45 carbon, 1.25 chromium, 2.75 tungsten, and 0.25 vanadium.

Hobbing Blanks

Blanks for successful hobbing are made from special hobbing steels, and are usually annealed before hobbing.

One type commonly used is a low-carbon, case-hardening steel with typical analysis of 0.05 to 0.10 carbon, 0.15 to 0.25 manganese, 0.03 to 0.05 phosphorus, and 0.02 to 0.03 sulphur. It has a maximum hardness of Brinell 100 for easy flow under pressure. The core hardness is not high, but a good wear-resisting surface can be obtained by proper carburizing.

Blanks of chrome-nickel steel may be used to provide higher toughness and greater resistance to upsetting. Their use, however, increases hobbing difficulties. Of such steels, the following is a typical analysis: 0.10 to 0.20 carbon, 0.30 to 0.60 manganese, 1.00 to 1.50 nickel, and 0.45 to 0.75 chromium. Brinell hardness ranges from about 120 to 160.

Thoroughly annealed tool-steel blanks can sometimes be hobbed, but generally have too poor a flow quality for being deep hobbed.

Before hobbing, that surface of the blank which is to come in contact with the hob should be ground and polished to a mirror-bright finish.

For reducing the power required to hob the impression, the blank can in some cases be relieved by removing metal from the bottom side (see Fig. 3). Depending on the hob's composition and shape, and the pressure to be applied, from 10 to 60 percent of the metal may be so removed.

Hobbing Rings

The relatively soft hobbing blank must be supported on its periphery, to prevent it from spreading diametrically away from the hob under the heavy pressures used in this process. Such support is provided by hobbing rings, or

From a paper delivered before the Seventeenth Semiannual meeting, ASTE, Oct. 28, 1949.

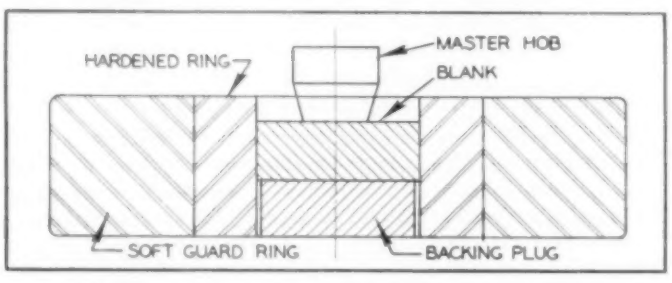


Fig. 1. Shown here is the relieving of a blank by removal of metal from its bottom surface.

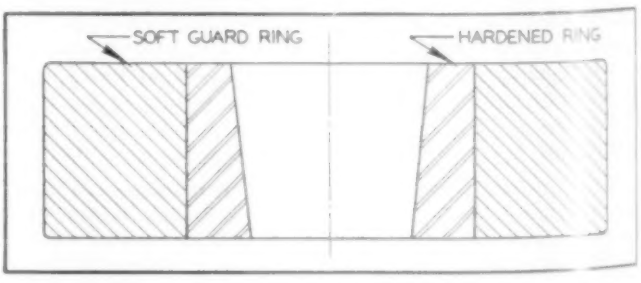


Fig. 2. Flow of displaced metal toward hob is facilitated by use of tapered center holes in hobbing rings.

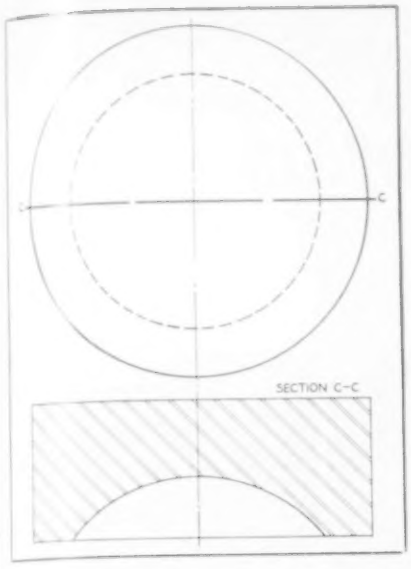


Fig. 3 (above). Typical setup for mold die hobbing.

Fig. 4 (right). Left to right are the hob, molded product and cavity blank for miniature steamship. Maximum impression length is 6½ in.

chases, which are of hardened chrome nickel steel (Figs. 1 and 2).

The sizes of round rings range from ⅝ to 13½ inches or larger, depending on the inside diameters of the chases, and upon the size of the hobbing blank which must fit inside the ring.

The rings may also be in rectangular shape, making possible the use of much smaller hobbing blanks. Whether rings are round or rectangular, the center hole is commonly straight although, occasionally, a tapered center hole (Fig. 2) may be used to aid the flow of metal toward the hob.

Hobbing Operations

The hobbing ring is placed on the press; the backing plug and the hobbing blank are placed inside it; and the hob is positioned over the blank (Fig. 1). There must be no foreign substances between blank and hob, and no lubricant used if a high luster is desired on the product. If a lubricant seems indicated to prevent hob breakage from high friction, a copper sulphate solution is very often used. A solution of 15 g of copper sulphate and 5 g of oxalic acid in 50 cu. m. of water has also been found satisfactory.

For the actual push, the low-pressure hydraulic press pump operates the ram until the hob begins to press into the blank against high resistance. Then the high-pressure system operates to give the ram a very slow movement. The hobbing or impression time ranges from 45 to 90 seconds, depending on depth of impression. A rapid rise of pressure indicates that the hob has stopped sinking into the blank and that the pressure must be immediately released to guard against hob breakage.

Hobbing pressures range from 50 to 200 tons per square inch of die impression. If the die blank is held within a hobbing ring, the needed pressure may be twice as great as the blank would require when unconfined.

Very often, the cavity is completed in a single operation. Where more than one push is required, the hob should be removed from the press and the blank annealed and, in some cases, relieved before each subsequent push. The size and depth of the cavity, the blank material, the fragility of the hob, and inadequate available pressure may require such repeated hobbing operations. Just a few points of carbon variation in the blank steel may demand 100 percent increase in the required pressure.

As many as six annealings may be required for some blanks. Annealing may be done by placing the cavities or plugs in charcoal-packed steel containers, sealing the cover with fire clay, heating to 1500 deg F, and slowly cooling in the furnace.

Because of the flow properties of the blank steel, a large cavity cannot be hobbed as rapidly as a small cavity.

When the cavity is fully hobbed, the upper surface of the cavity blank is irregular, because of the uneven upward flow of displaced metal. This surface must be machined to the shape required for matching the opposed die section.

The die then is pack-hardened to a depth of about 1/16 inch and, in some cases, tempered. The impression surfaces are then polished to regain any luster which heat treatment may have destroyed.

Hobbing Precautions

Cavities should not be designed with outside dimensions larger than necessary for the intended function of the molded part, because relatively small cavities in large blanks will make the work of hobbing difficult to impossible. A wall thickness of ⅜ to ½ inch is sufficient in most cases.

An oil-hardening steel is preferable for the hob; a water-hardening steel will not harden to sufficient depth.

The hob should not be designed with a large or cumbersome shoulder at the base, and must not be so designed when closing-in operations are required.

It is of the first importance that the hob be protected against overload. For this reason, particular care must be given to the location and amount of relief on the blank when planning to make single-push impressions. Where impressions require two or more pushes, maximum skill is required of the hobber.

Once the blank is mounted in its ring and the hob commences to sink, you cannot see what is happening; not until the hob is withdrawn from the impression can it be known whether the operation has been successful. If the preliminary work of design and mounting has been faulty, it may be the work of a few seconds to ruin a hob in which many hours and dollars have been invested. On the other hand, given good hob and blank design, proper mounting, and skilled press operation, hobbing will provide products of high uniformity and quality with outstanding production economies.

2. Mold Finishing

By M. C. Overholt

CONSULTING ENGINEER

THE SELECTION OF proper tools for cavity, or mold work, is of great importance, since it has a definite bearing on the results that will be obtained on the finished product. For instance, a well ground cutting tool with a keen cutting edge, will leave a tool mark of approximately 0.002 to 0.003 inch in depth, which can be eliminated in finishing. On the other hand, a tool that is not properly ground and which cuts with a definite drag, will leave a tool mark that can easily be 0.025 inch in depth. This can cause trouble in finishing the cavity, and may result in scrap, since the tool marks are so deep that, when they are finally removed, the cavity could be up to 0.050 inch oversize.

The proper application of cutting tools to the work itself has a definite bearing on the actual finishing of a cavity. Take, for an example, a cavity that is being cut by using a follower and the buzzer system. Suppose that we select a poorly ground cutting tool, that we extend this particular end mill one inch farther out of the collet of the machine than is necessary and, after the set-up is complete, proceed with the actual cutting. After the follower has passed over the course of the templet and comes to the end of its travel, it is found that the cutter has been lagging behind through its entire travel. If we drop out the cutter at this point, we may be several thousandths of an inch from the actual finish line of the cavity. This, again, requires otherwise unnecessary hand work to finish the cavity because we have not removed enough metal. Thus, both of the principles previously discussed have been violated because the tool (1) has not been properly selected, and (2) has not been properly applied because of the extra length protruding farther than necessary from the collet.

Granted the selection and application of the tools, the task of actually finishing the cavity commences. After the cavities have been machined as near to shape and size as possible, there will be a series of small tool marks going in all directions. To remove these marks and get the final polish, first select an assortment of hand riffle files of various cuts, and start with a fairly coarse file, perhaps one of about 0 cut. File with a criss-cross motion; in other words, cross over the tool marks back and forth. Never file in the same direction as the tool mark runs, as this tends to deepen, rather than reduce, the tool mark.

After going over the surface in this manner, repeat the procedure with a finer file. Again file crosswise of the first file marks; when this is completed, all the tool marks should have been removed and the cavity will be ready for polishing. One popular method of polishing is to use a Bright Boy polishing stick, or a fairly coarse polishing compound on rubber polishing wheels with a hand power tool. If these are not available, the use of an ordinary piece of soft wood impregnated with polishing compound has proved successful.

See Fig. 1 for a complicated cavity that is difficult to finish because of the unusual number of short walls or ribs. The polish on this particular cavity was achieved by using an impregnated piece of soft wood, and hand work.

After polishing has been completed the surface should be free from tool marks and file scratches. It is not advisable to have a high polish on a cavity that is to be heat treated, because a highly polished surface seems to pit in heat treating, and this is particularly bad in stainless steels. However, it is much easier to obtain a high polish on a piece of hardened steel than on a piece of soft steel, provided that all marks and scratches have been removed before hardening.

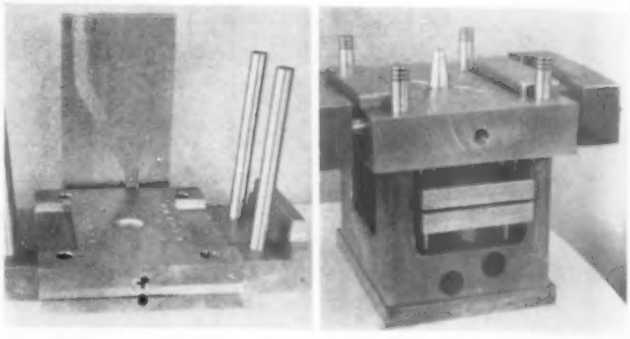


Fig. 1. Top half (left) and bottom half (right) of a complicated cavity having large number of short walls or ribs.

There are a number of methods of obtaining a high polish. One involves repeating operations similar to those used in the filing process, except that there is now a hard skin or scale to remove in getting down to the actual cavity surface. To get through this scale, use a coarse lapping compound on rubber or felt impregnated polishing wheels. Another way is to use a free-cutting oilstone, using a soluble such as gasoline or coal oil. Results with either method are effective. After the scale is removed, continue with the polishing compounds and, after this, finish with a fine powder to obtain a mirror-like polish.

If an atmosphere-controlled furnace has been used for the hardening, the removal of scale becomes a minor job.

Liquid honing is a recently developed process than can be used effectively in mold finishing. The process operates somewhat along the lines of a sand blasting machine except that, in place of the sand, a liquid is used containing a certain type and grade of polishing compound mixed with ordinary water. This is forced through a nozzle, at 100-lb air pressure. In one case, a comb mold, the only polish used on the mold after hardening was produced by liquid honing. A total 225,000 shots was taken off this mold in the first run. The liquid honing process does not remove any metal, nor does it break down sharp corners.

To sum up on the topic of mold finishing, we must pay attention to four points:

1. The cavities must be to proper shape and size, and free from undercuts and scratches, because undercuts will stop a mold from working and if a mold doesn't work, it is not properly finished.
2. Mold cavities must be properly hardened to insure long life. After all, the finish on a mold covers many points.
3. The more polish there is on the mold cavities, the more luster results on the parts produced.
4. Mold faces and gate runners must be smooth and well finished to obtain satisfaction.

From a paper delivered before the Seventeenth Semi-annual meeting, ASTE, Oct. 28, 1949.

Economic Factors in Milling

By Mario Martellotti

DEVELOPMENT ENGINEER

THE CINCINNATI MILLING MACHINE COMPANY

In every machining process there is an orderly procedure to follow in the acquisition, use and maintenance of the milling equipment that results in operational cost economies. For example, it is sometimes more economical to provide special milling cutters fitted to the particular requirements of a milling operation than to use milling cutters of standard type which are available from stock and may be lower in initial cost. Standard milling cutters may often require adjustments in the number of teeth to insure satisfactory cutting conditions. In some cases, as for example with slab mills, when milling wide surfaces, the length of tooth contact produces a long chip which is difficult to handle. More importantly, the variation in periodic cutting load may set up vibrations which affect cutter life, quality of the machined surface, and, finally, are conducive to experimentation in an effort to improve the operating conditions. This procedure is costly because in order to correct these conditions, the original cutter must be either modified by the cut and try method, with consequent losses in production, or discarded, and a new solution of the problem must be attempted by designing a special cutter.

Difficulties of this nature may arise, especially when a number of cutters are mounted on the same arbor, as for example, in gang milling operations.

Here, the combining of standard cutters which may often have different diameters and number of teeth makes it possible to have the same feed per tooth for all cutters unless all the cutters have the same number of teeth. This results in some of the cutters taking a light and others a heavy chip, with consequent variation in cutter life. There are also cases in which standard cutters of the same diameter but of different type may have a different number of teeth. If the variation in the number of teeth is small, the feed per tooth will not be greatly different in the two cutters. However, in a concrete example of gang milling with side mills and slotting cutters of standard make, where the number of teeth was 16 and 32 teeth respectively, the side mills were taking a feed per tooth twice that of the slotting cutters.

A milling cutter, to provide satisfactory results, should be selected after an analysis has been carefully made of the factors involved. Objectives include reducing to a minimum the expenses which are encountered in its use, such as the cost of the cutter, the cost of maintaining it in efficient operation by grinding or repair, the power cost in removing the material from the part being milled, and the cost which may result for the lost productive time when the cutter performs poorly. The first cost of a milling cutter, as well as the first cost of any equipment, is not as important as the running cost or the cost to keep the equipment in operation.

Handling, Storage and Grinding of Milling Cutters

The productivity of a milling machine depends largely on the efficiency of the milling cutter. To have a high efficiency, it is necessary not only to make the proper selection of the type and design of the cutter, but also to properly maintain it by sharpening correctly and carefully and by proper care

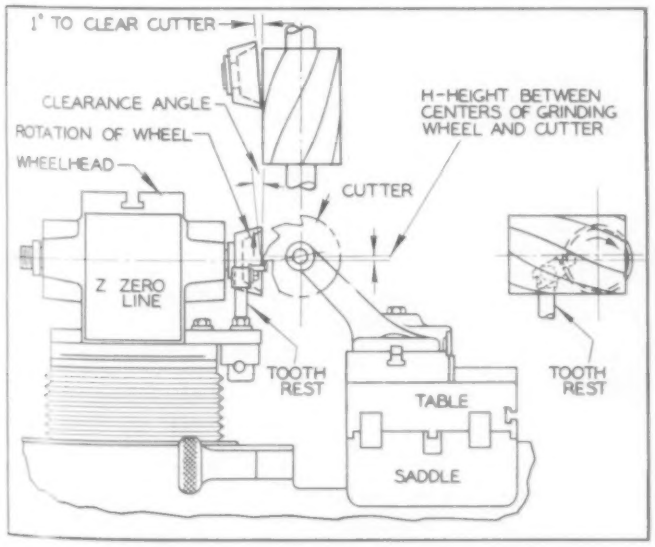


Fig. 1. Grinding the clearance angle on profile type cutters with a cup type wheel.

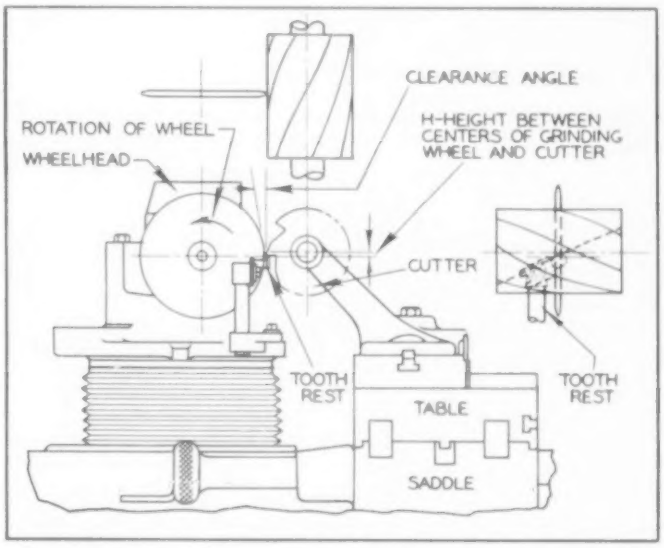


Fig. 2. Grinding the clearance angle on profile type milling cutters with a disc type wheel.

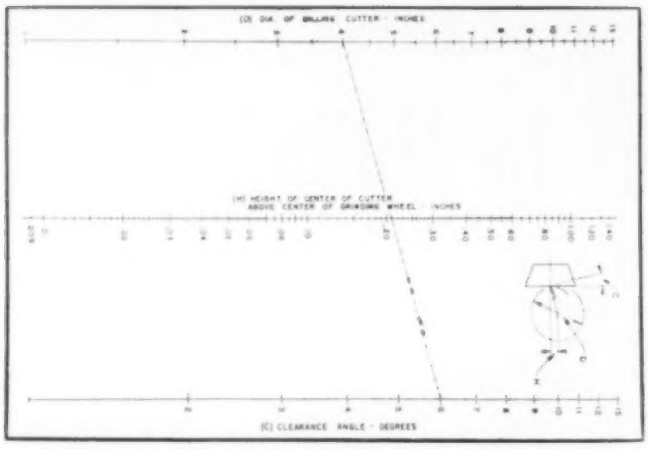


Fig. 3. Nomograph giving the value of H for given values of cutter diameter and desired clearance angle. The value of H is read in the center scale at the point of intersection of a line connecting cutter diameter and clearance angle.

in the handling and storage. A correctly sharpened cutter requires less power, produces better work and will give longer service than the one which has been poorly ground and carelessly handled.

Milling cutters are expensive tools and must be stored in such a manner as to avoid damage to the cutting edges. A nick on the cutting edge appears as a flaw on the milled surface, and to remove it, the cutter must be reground. Grinding should be necessary only when the cutter becomes dulled through normal use, since any unnecessary grinding will shorten the life of the cutter. The cutter should be inspected after use and reground if necessary before storing it. Cutters in storage should be flushed with heavy oil to prevent rust formation and be placed in wooden boxes or on boards with pegs.

The clearance angle on the flank of the teeth should conform with the accepted values for the type of work being performed by the cutter (Milling Cutter Design and Operation, page 34, The Tool Engineer, July, 1949).

If a record is kept of the clearance angle used on each job, it is possible to provide cutters with the clearance which has been found to give the best performance on the same kind of work.

Clearance angle should be checked after each resharpening. Variations in its value will result in a wide difference in cutter life.

Sharpening of Peripheral Milling Cutters

In peripheral milling cutters, the clearance angle is provided by grinding a narrow land on the periphery of the teeth as shown in Fig. 1, using a cup type grinding wheel or as in Fig. 2, using a disc type grinding wheel.

With both methods, the clearance angle is generally obtained by setting the center of rotation of the grinding wheel below the centerline of the cutter by a predetermined amount H as indicated in Figs. 1 and 2, while the cutting edge, supported by a tooth rest, is maintained in fixed relation to the grinding wheel. The clearance angle is usually very small, and the vertical distance H can be computed by means of the following formula:

$$H = 0.0087\ D_c C \qquad (1$$

where:

H—Vertical setting, inches.
D_c—Diameter of milling cutter, inches.
C—Clearance angle, degrees.

For both cup and disc type wheels, the approximate value of H corresponding to the given values of cutter diameter and clearance angle can be obtained from the nomograph shown in Fig. 3.

A simpler procedure is possible which uses a device known as the clearance setting attachment, shown mounted at the left of the cutter in Fig. 4. This device permits setting up the machine for the proper clearance angle quickly, accurately and directly, without using formula or chart.

The clearance setting attachment is mounted on the left tailstock, and consists of a fixed plate with a zero mark, the dial with graduations in degrees of the clearance angle, and the clearance setting dog provided with a pin.

The fixed plate is clamped to the tailstock by means of screw T. The clearance setting dial is locked to the tailstock by means of thumb screw S. When the zero on the graduations is in line with the zero line on the fixed plate the pin of the clearance setting dog is inserted in the corresponding hole in the clearance setting dial. The clearance setting dog is then clamped to the arbor supporting the cutter. With the tooth on the tooth rest the clearance setting dial is unclamped, the wheel head lowered until the desired angle is read on the clearance setting dial opposite the zero mark on the fixed plate.

The clearance setting dog can now be removed. The machine is ready for grinding the clearance angle on the cutter.

When sharpening profile cutters with a cup type wheel, Figs. 1 and 5, a flat surface will be ground on the flank of the tooth, and the clearance angle produced will be the same as the desired clearance angle.

When sharpening profile cutters with a disc type wheel (Figs. 2 and 6), the contour of the land is an arc of a circle corresponding the diameter of the grinding wheel, and the desired clearance angle is obtained only at the extreme tip of the tooth next to the cutting edge. Thus, the effective clearance angle is smaller than the desired clearance angle. In order to reduce the effect of the curvature of the grinding

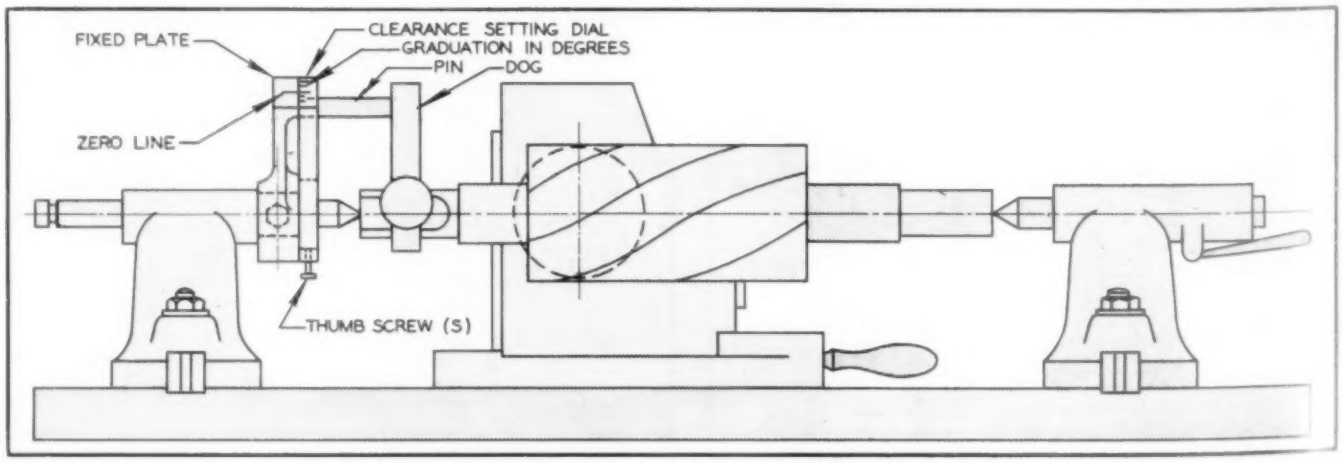


Fig. 4. Clearance setting attachment used in grinding the clearance angle on a helical mill.

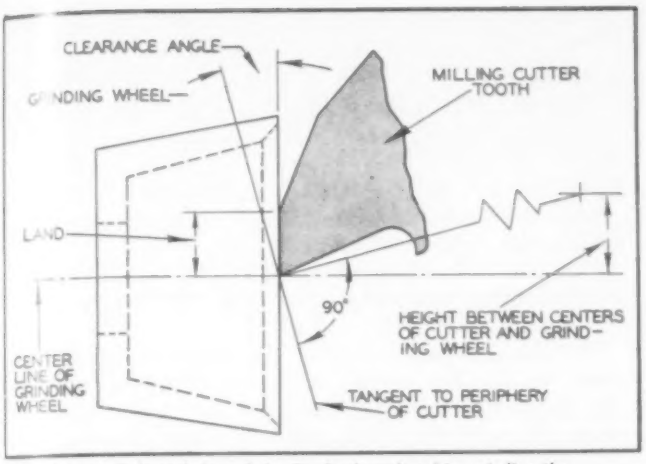


Fig. 5. Enlarged view of the flat land produced by grinding the clearance angle with a cup type wheel.

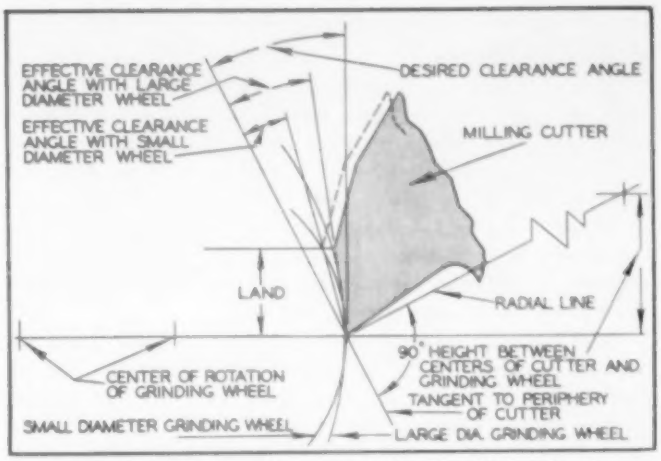


Fig. 6. Enlarged view of the concave land produced by grinding the clearance angle with a disc type wheel.

wheel, it is necessary to limit the width of the land and to use grinding wheels of 6 to 8 in. diameter.

Grinding Shaped Profile Type of Milling Cutters

Due to the complicated outline of these cutters best results in the grinding operations are obtained by grinding them in contour grinding machines which permit the performing of the operation on either simple or complex tooth forms easily and accurately.

Grinding Face Milling Cutters

In face mills, the clearance angle on the periphery, the face and the chamfer or corner angle are ground by a method similar to that used in grinding plain milling cutters.

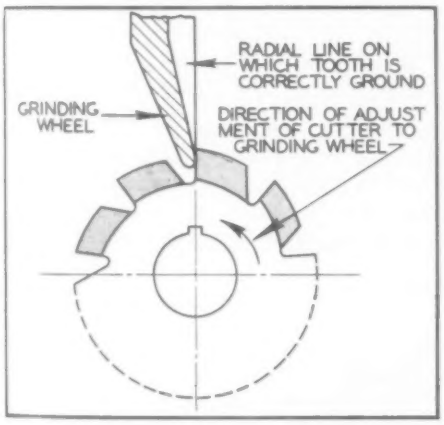
Grinding Form Relieved Cutters

In these cutters the clearance back of each tooth is produced during manufacture and cannot be ground without seriously affecting the accuracy of the profile. Consequently these cutters are sharpened by grinding the faces of the teeth.

Form relieved cutters made with teeth having zero rake angle, should always be sharpened radially. The face of the grinding wheel should be lined up with the centers on which the cutter is mounted. (Fig. 7)

Form relieved cutters having teeth provided with a radial rake angle, should be sharpened by placing the face of the tooth in a plane tangent to the base circle as shown in Fig. 8. The radius of the base circle gives the set-over of the face of the grinding wheel, with respect to the axis of the cutter, and thus determines the radial rake angle. Knowing the degrees r of the rake angle, and set-over D inches for a cutter of radius, R inches can be calculated as follows:

$$D = R \sin r \qquad (2$$



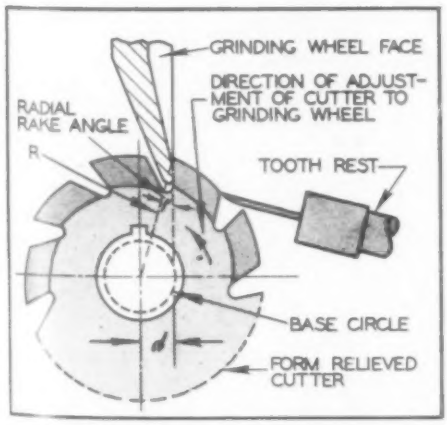


Fig. 7 (top left). Form relieved cutter with zero rake angle, and showing correct position of grinding wheel face with respect to center of cutter.

Fig. 8 (bottom left). Form relieved cutter with rake angle, and showing proper relation of grinding wheel and tooth rest.

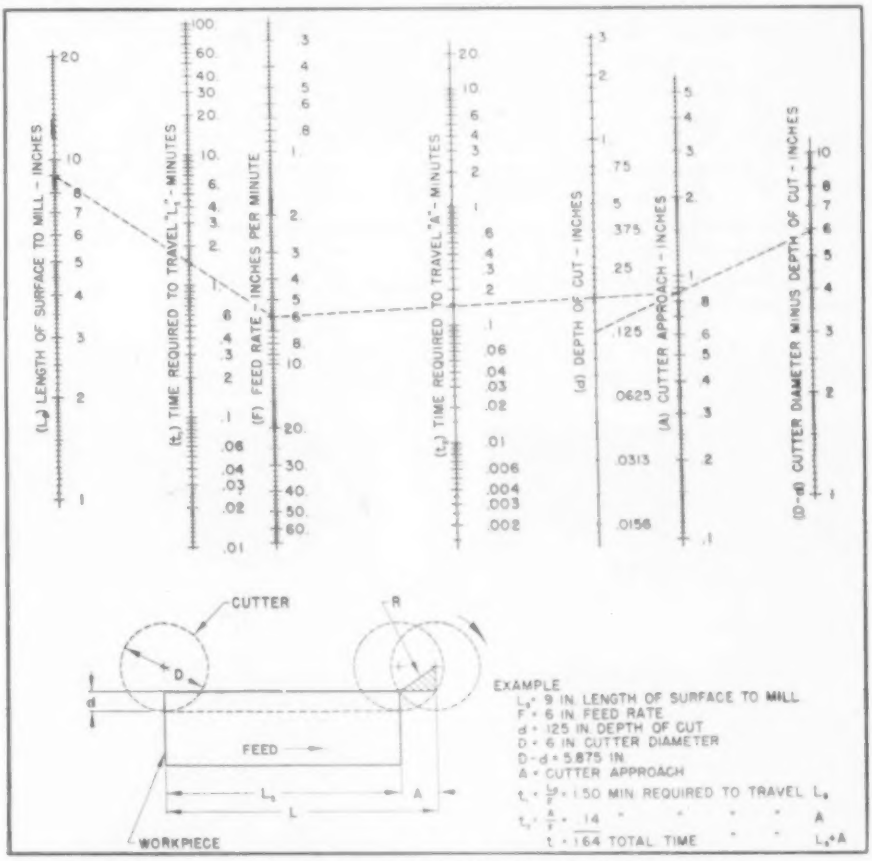


Fig. 9 (above). Alignment chart for determining cutter approach and time required for milling a piece of a given length in peripheral milling.

General Rules for Grinding All Types of Milling Cutters

Milling cutters are preferably sharpened dry, although wet grinding is used in some cases when sharpening sintered carbide cutters. The grinding wheel should be dressed carefully to obtain the proper cutting action of the grains and a narrow land at the rim to limit the area of contact.

A soft bond and coarse-grained wheel should be used in preference to hard bond and fine-grained wheel, in order to prevent burning or overheating the cutting edge. Softer wheels cut easily and develop less heat.

The grinding pressure should be light and the stock removed per pass should not exceed from 0.002 to 0.003 in. and 0.0005 to 0.0015 in., when grinding saws and narrow milling cutters made of high speed steel. With sintered carbide cutters, the amount of stock removed per pass should be from 0.00015 to a maximum of 0.0004 in., depending on the grit of the grinding wheel and the type of operation. More stock can be removed per pass when rough grinding and corresponding less stock should be removed when finish grinding. Diamond wheels are preferred for resharpening sintered carbide cutters. In this case wet grinding with a mild soda solution is used. The sharpening of the cutter should not be delayed to the point where the cutting edge has become badly worn and considerable grinding will be necessary to restore it to its original condition. This will shorten the possible life of the cutter and add to the cost of the operation. After the cutting edge of the teeth is ground, stoning should be used carefully to remove only the burrs resulting from the grinding operation.

Other factors affecting the efficiency of the cutter are the keenness of the cutting edge and the finish on the face of the tooth in contact with the material to be cut.

A milling cutter with clean cutting edges and a high finish, free from burrs and grinding marks will have more efficient cutting action, produce a better quality of finish on the machined surface and last longer than a cutter with edges showing a poor finish. If not properly ground, the cutting edge appears as an irregular saw tooth shape when viewed under the microscope. This is especially the case with sintered carbide milling cutters as shown in Fig. 10.

This condition produces an irregular flow of the material of the chip and a rough machined surface. It also results in stress concentration, high friction and localized heating, which tends to accelerate tool breakdown.

Smoothness of the cutting edge and finish on the face and land clearance of the tooth of 1.0 to 1.5 micro-inches (rms) are desirable but 3.0 to 4.0 micro-inches may be satisfactory (Fig. 11 A-B).

Cutting Speed

The life of a milling cutter between resharpenings is particularly important because the down time of the machine while changing cutters, checking the operation with the newly ground cutter and the grinding of the dull cutter, affects the production rate of the milling equipment and adds to the cost of the operation.

The life of a milling cutter for a given cutting condition is affected by the cutting speed (The Tool Engineer, June, 1949, page 19, Fig. 6).

To obtain a long cutter life the cutting speed should be relatively low, but for any selected feed per tooth, the production rate will be high while the cutter life will be low when the cutting speed is high. Between these two conditions there is a cutting speed which will make possible to balance the cost chargeable to the machine and that chargeable to the cutter, so that the overall cost will be a minimum. The cutting speed which will permit the obtaining of this condition can be determined as follows:

If C dollars per hour is the machine rate and P is the cutter cost (which includes pro-rated cost of cutter per sharpening, grinding machine rate, grinding wheel cost, etc.), the economic cutter life expressed in minutes can be calculated as follows:

$$E = \frac{60P}{C}\left(\frac{1}{a} - 1\right) \qquad (3$$

where:

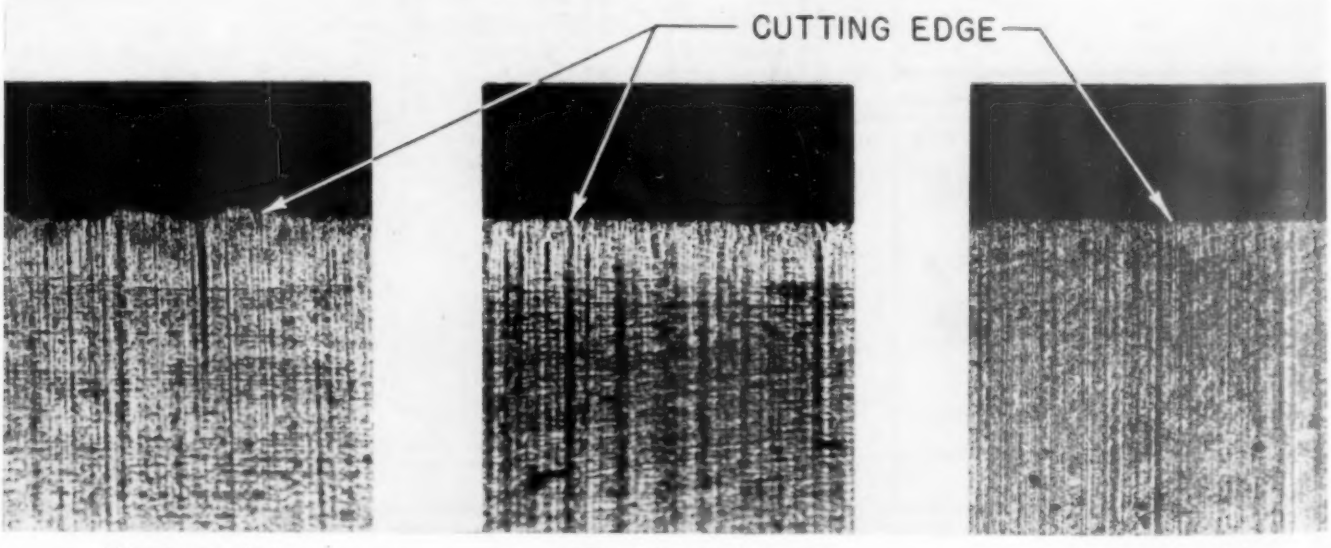
E = Cutter life minutes.
P = Grinding cost of cutter, dollars.
C = Machine rate per hour, dollars.
A = Factor depending on the material of the cutter and the material to be cut.

The constant a is obtained from a chart similar to that shown in Fig. 6, page 19, The Tool Engineer for June 1949. In this case a is equal to 0.5, 0.15 and 0.11 for sintered carbide, cast non-ferrous and high speed steel respectively.

As an example of the application of the above formula the following conditions are assumed:

Machine rate C = $8.00 per hour.
Cutter and grinding cost per resharpening = $10.00
Constant a = 0.5 for a sintered carbide cutter milling cast iron material.
Substituting these values in formula (3):

$$E = \frac{60 \times 10}{8}\left(\frac{1}{0.5} - 1\right) = 75 \text{ minutes}$$



120 grit green wheel | 100 grit diamond wheel | 240 grit diamond wheel

Fig. 10. Micrograph showing the condition of the cutting edge of sintered carbide tips ground with different kinds of grinding wheels. Magnified 100 times

This is the economic cutter life in minutes between resharpenings. From Fig. 6 page 19 of June, 1949, issue of The Tool Engineer, the cutting speed is obtained by drawing a vertical line from the 75 minutes point in the time scale to intersect the sintered carbide line. To this point corresponds a cutting speed of approximately 470 ft/min.

The same procedure can be applied to other types of cutters, cutter material and material being cut by determining the value of the factor a from two or more values of the cutter life values corresponding to different cutting speeds. The slope of the line joining the points plotted in a log-log paper will give the value of a to use in formula (3).

Milling Operation

Any reduction of the time required for a milling operation is an important item of economy and justifies time and effort to determine the best way in which a milling operation might be performed. In a large number of cases, a thorough examination of the job will reveal the fact that a milling operation can be done in various ways and one of these will be the most economical way of performing it.

Assuming for example, that the foot of a cast iron bracket is to be milled for bolting to the frame of a machine. No particular fixture is required to hold the piece, since it can be easily held in a milling machine vise. It would seem that this operation is so simple that one method of milling is just as efficient or economical as another. Yet, this operation can be done in several different ways, each requiring a different time to complete it. A single vise could be used holding one piece or two vises one behind the other each holding one piece, or a special fixture designed to hold several pieces in line or side by side and/or in tandem. To easily analyze the different methods, it is assumed that the foot of the cast iron bracket has the dimensions 2 x 4 in. Further it is assumed that the cut can be taken at the feed rate of 6 in/min. The piece is clamped so that the length of feed is on the narrow width of 2 in.

With the first method, a single piece clamped in a vise, the work piece must travel practically $\frac{5}{8}$ in. before its edge contacts the 3 in. diameter plain milling cutter on the center line. This distance is known as cutter approach and can be obtained for different operating conditions by means of the chart shown in Fig. 9—when using peripheral milling cutters. A similar chart can be produced for face milling cutters.

"Two-Vise" Method

The time required for the cut is 7/16 of a minute or 26 seconds, the total travel being $2\frac{5}{8}$ in. At the end of the feed the machine table is advanced to clear the cutter and stopped. Allowing 5 seconds to advance and stop the table feed; 10 seconds to remove the piece, 10 seconds to return table to starting position, 10 seconds for loading the vise with a new piece, 5 seconds for starting the table, and rapid advance it to the cutter, there is a total of 40 seconds. This amount, added to the 26 seconds of milling time, makes a total time of 66 seconds for milling one piece and on a 51 minute hour the production rate per hour would be approximately 43 pieces.

Using two vises, the operation could be carried out as follows:

A piece is placed in one vise and the machine table is started. While milling the first piece a piece is placed in the second vise. When the first piece is milled the table is advanced rapidly to bring the second piece to the cutter. The table is then thrown into feed and while milling the second piece the first piece is removed. When the second piece is milled, the machine table is stopped and the piece is removed. The table is returned to starting position and the cycle is repeated.

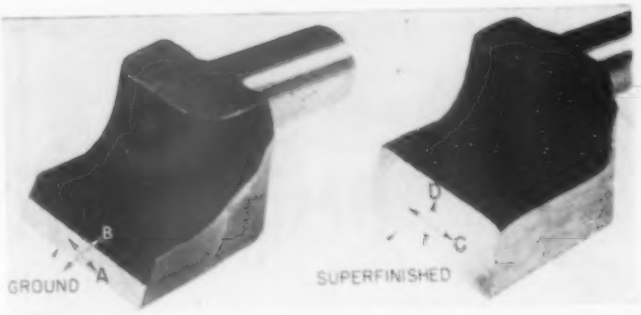


Fig. 11A. Face of a cutting tool showing (left) finish produced by a regular grind, and (right) a finely finished surface.

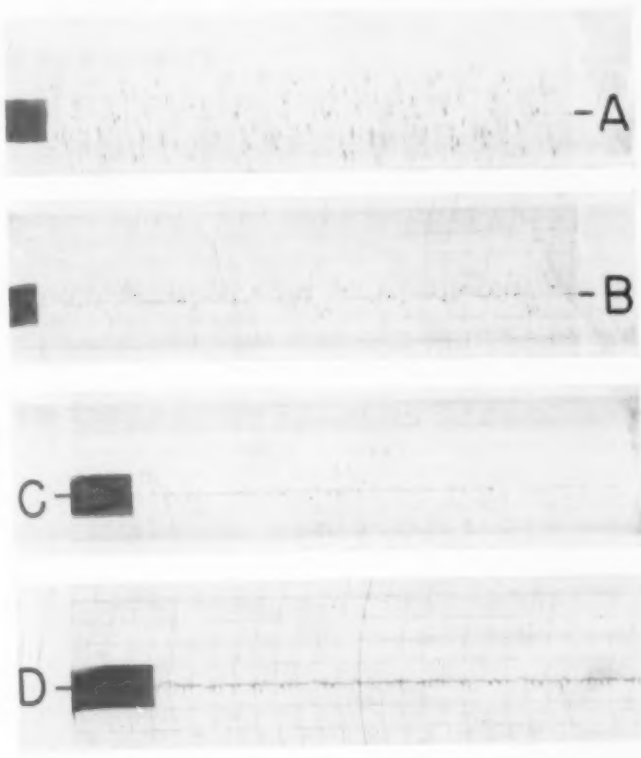


Fig. 11 B. Character of surface obtained with Brush analyzer.

A—30-50 Micro in. Rms Across grinding marks

B—4-18 Micro in. Rms With grinding marks

C—2.5 Micro in Rms Along face

D—2.5 Micro in. Rms Across face

The time is as follows: Place first piece in the vise 10 seconds, start table and rapid advance to cutter 5 seconds, mill first piece 26 seconds, rapid traverse table 3 seconds, mill second piece 26 seconds, advance table to clear and stop table 8 seconds, remove piece 10 seconds, return table 10 seconds, altogether 95 seconds for milling two pieces or 49 seconds per piece. The production rate per hour is now approximately 62 pieces. With this method the production per hour has been increased 44 percent over the previous method.

If the pieces were placed in the tandem in a special fixture which would permit clamping 10 pieces close together, the time study would give a time per piece of 28 seconds, and a production rate of 109 pieces per hour, or approximately $2\frac{1}{2}$ times the hourly production obtained with the first method.

The same procedure can be used in the analysis of other milling methods. From this analysis it is then possible to determine the most convenient method to use in relation to the quantity of pieces to be milled in a lot or per year.

Design of Fixture Elements

By Hans W. Smith

Clamps and Fixture Components

THE toggle clamp provides heavy pressure, operates at a fast rate and gives complete clearance for unloading. A "C" toggle clamp is shown in Fig. 1. This type cannot accommodate more than minor variations in stock thickness, and must therefore have a means of adjustment as provided by the screw in the clamping end. The handle end rests on another screw for adjustment of the travel beyond dead-center.

This principle is also employed on a pusher type clamp shown in Fig. 2. Adjustments are again provided on the clamping end and on the handle end for setting the travel beyond dead-center.

Air-operated Clamps

Clamping pressure can in many cases be conveniently supplied by an air cylinder. Where unusually heavy pressure is required or where several clamps must be operated simultaneously, air cylinders are widely used. The stroke of the cylinder is slightly larger than the travel of the clamp (Fig. 3).

Fixture Components

The following section describes a number of various parts frequently used on fixtures. The preceding material on stops and locators and clamps comes also under this heading, but the great variety of these items merited separate classification.

A hand knob preferably made from malleable iron, used for clamping screws, is illustrated in Fig. 4. It can be turned by hand or, to exert greater force, any size bar that is handy can be inserted between the prongs. It is press-fitted on the shank of the screw and cross-pinned.

Where great force must be exerted, the forged or "cut from the solid" handknob shown in Fig. 5 can be used. The wings are strong enough to permit using a hammer on them.

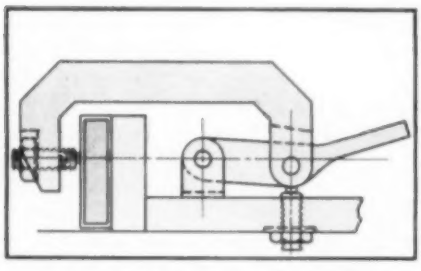
A knurled handwheel is the thing to use where little force is to be exerted. By making the diameter large enough a good medium force can be exerted by handturning. For screws which require very little force for turning as for locking, a tee handle can be quickly formed by welding a crosspiece on to the screw.

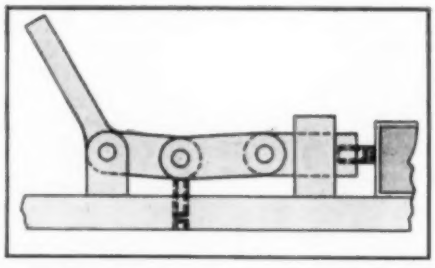
On drill jigs of the box type it is often necessary to load the work from the side. If the weight of the work is considerable, this is hard to do. For easier loading, project two rails from the fixture to enable the work to be loaded and slid into the box (Fig. 6). The rails are hardened and ground and provided with grooves which keep them clean. Small particles of dirt and grit are swept into the next groove by the moving work.

Temporary Location

Often the work is centered on a tapered plug such as with camlift fixtures (see Fig. 7), and it is necessary to bring the work first into the approximately correct position under the taper plug. This is called a temporary location and is accomplished in the illustrated design by having the rails (Fig. 6) so machined that the work is held on proper center with one-sixteenth clearance on the side. The set screw in the rear does the same in the direction of sliding and the work can be freely moved into engagement with the centering taper plug.

As an alternative, the lifting of the work as mentioned for Fig. 7 can be done with a cam. In the design illustrated (Fig. 8), a plunger carries a seat, free to a limited extent to swivel and adjust itself. The seat pushes against the work, lifting it. The plunger is raised by turning a handle





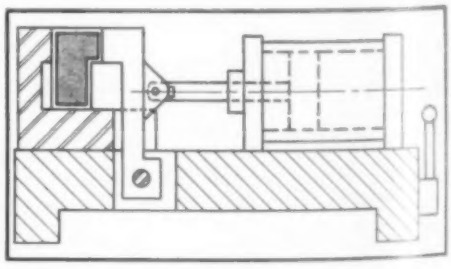
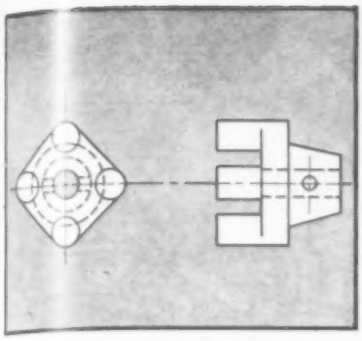
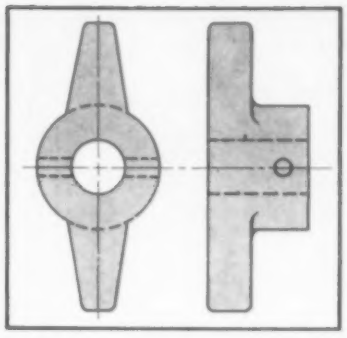
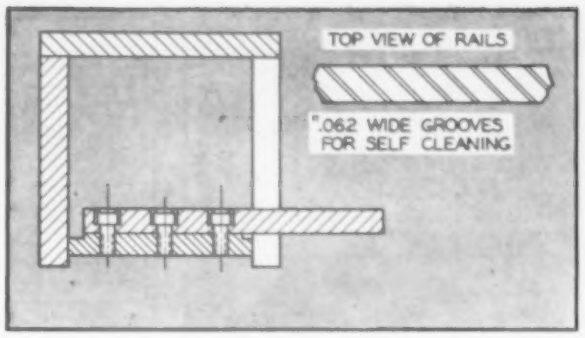


Fig. 1 (left) illustrates the toggle clamp, which provides heavy pressure at a fast rate, with complete clearance for unloading. Fig. 2 (center). A similar principle is applied here on a pusher-type clamp. Adjustments on the clamping and handle ends permit setting travel beyond dead-center. Fig. 3 (right) shows a typical air cylinder design, permitting simultaneous clamp action.







Two varieties of hand knobs are illustrated in Figs. 4 (left) and 5 (center). Knob at left has prongs for exertion of further force; forged knob at center is designed for great stress. Fig. 6 (right) shows a design using two rails for sliding fixture back and forth for loading and unloading. This can be utilized where heavy workpieces must be loaded from the side

which rides on a cam. The cam is so shaped that it produces a quick rise during the first quarter-turn and a slow locking rise during the next quarter.

At times the work must be located from its outside contour. This is done by setting it on a rest with an outline corresponding to the work contour, called a target (Fig. 9). To seat properly on such a continuous surface, the base of the work is machined first. The target is hardened and ground. To facilitate picking the work off the target, its surface is relieved in two places so that the operator can get under the work with a tool.

It may in some cases be advantageous to employ an outside target, that is one with a hole of such contour that it conforms to the outline of the work but is slightly larger. It should be made so that a convenient gage block approximately ¼ in. can be tried all around the contour. This is shown in Fig. 10.

Guiding With Drill Bushings

When the work is very heavy and is loaded into the fixture by a crane, it is helpful to shape the stiffening ribs on the fixture so that they steer the work into its correct position in the fixture (Fig. 11).

Drill bushings serve as guides for the drills or reamers (Fig. 12). They are hardened and ground and will insure proper location of a hole within the tolerance required for clearing the drill, that is approximately 0.001 in. For plain drilled holes, the drill bushings are pressed into a bore of the fixture and are thus permanent. For large runs of production, the drill bushing is ground to a slipfit into the bore of the fixture and locked into place. It is thus replaceable. When it is necessary to remove the bushing frequently, a hardened liner is provided as well as a lockscrew which locks the bushing when turning ninety degrees in the rotation of the moving drill. Such a slip bushing is used when different hole sizes are required for a stepped bore; when a hole has to be reamed and a special reamer-bushing is used; when a hole is tapped while the work stays in the fixture. Slip bushings have a knurled head, fit close into the liner, and are therefore hard to remove. As a result it is better to provide a little handle to "wring out" the bushing. The handle can be tacked to the finished hardened bushing or tapped into the head before hardening.

Bushings should either sit directly on the work surfaces, and the chips taken up through the bushing, or stay away from the work surface for one-half to one and one-half drill diameters, and the chips left to drop into the fixture. Provision must then be made for chip removal. On machined surfaces it is best to let the bushing rest directly on the work. On rough surfaces let the bushing stay away. Too small a gap between work and bushing invites drill breakage.

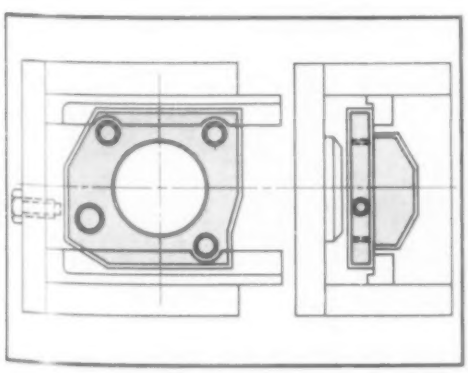
When two holes are located so close to each other that not enough room is left for a liner, a special bushing can be made employing one or two holes. With the one-hole setup the hole is set eccentric, and the bushing is turned around for the second hole.

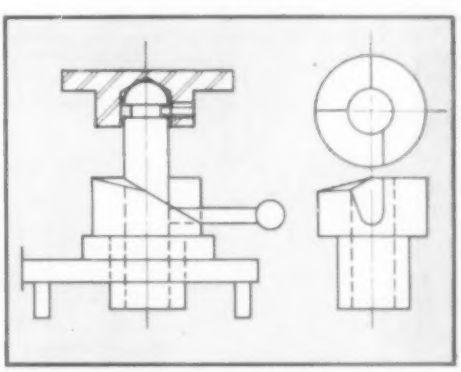
Fig. 13 illustrates a pusher used to move the work parallel toward a locator. The illustrated two point pusher provides a simple and accurate means. Turning the handwheel moves the screw and thus the whole pusher slides in.

Designing Drill Jigs

Drill jigs should be designed to provide a light and yet rigid product, as seen in Fig. 14. A clearance of three-fourths inch all around the work is recommended. The fixture walls can be made from light steel plate and a rim of heavier stock is then welded to the top. This gives a section heavy enough to provide "meat" for the tapped holes to fasten on the bushing plate. The bottom plate can also be light and stiffened with ribs. The ribs are machined and the crossribs left slightly smaller so they do not have to be machined. The bottom plate projects sufficiently beyond the fixture walls to set on hold-down clamps.

Where holes are required inside the fixture box and be-





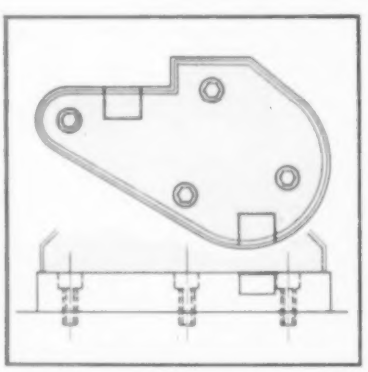
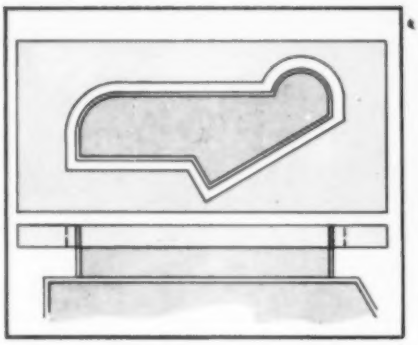
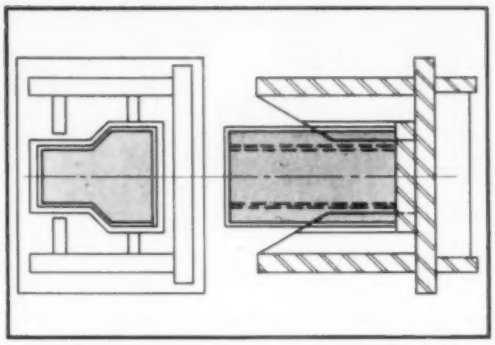


Fig. 7 (left). Machined rails here hold work in position when centering workpiece on tapered plug. Fig. 8 (center) shows a cam design usable as an alternative to Fig. 7. Work here is raised by plunger and swivel seat. Fig. 9 (right) shows a rest with outline similar to contour of work, used when work must be located from its outside contour.





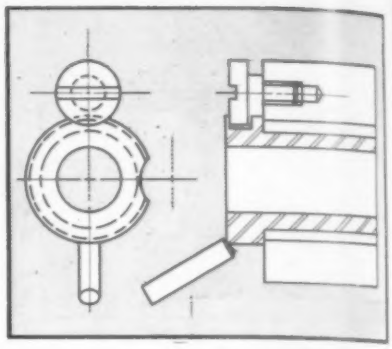


Fig. 10 (left). This design resembles Fig. 9. Employing a larger-sized contour of the work, it is termed an outside target. Fig. 11 (center) illustrates a method of stiffening ribs on fixture to aid in handling heavy work. Fig. 12 (right). Here drill bushings are shown for accurate guiding of drills or reamers. Bushings will insure location of hole within tolerance of 0.001 in.

hind the fixture wall, it will be necessary to provide a slightly larger access hole in the fixture wall for drilling those holes. When a hole is completely inaccessible for drilling, it can be placed in a separate block which is fastened to the outside walls by screws (Fig. 15).

Brackets such as those in Fig. 16 are frequently used on fixtures for various purposes. The ribs connecting the barrel to the floor plate are set under ninety degrees, thus making the design strong against bending forces in two places. The same principle is generally followed on many other parts of fixtures.

Indicators

Sometimes the work, after being located in the fixture, must be held to an additional dimension such as the distance *X* shown in Fig. 17. To avoid measuring with a scale, to eliminate errors and facilitate this part of the operation, an indicator can be built into the fixture. Here a tapered cup is advanced by a screw with a handwheel, providing a reading on the fixed and graduated ring. This ring can be set at a certain zero position and locked, giving immediate reading for plus or minus deviation from the desired position.

For certain jobs the work may be moved by screws into proper position inside the fixture (Fig. 18). This position can be checked with a lever-type indicator as shown. A lever is moved by hand against the work and the position compared with a machined block on the fixture. This block consists of two faces differing by the allowed tolerance. Initial adjustment of contact with the work can be made by a setscrew and locknut.

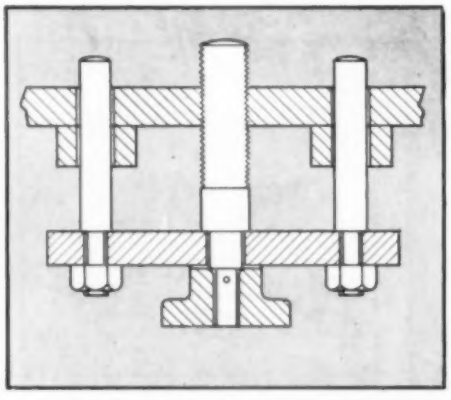
Wear problems on tapped holes which are constantly used can be aided by the screw bushing. To make repair on such holes more convenient it is well to place them in a bushing which can be hardened and replaced when necessary. The shoulder of the bushing is then set so that it will take the force developed in tightening the screw. Bushings are often placed in a hinged leaf which can be opened for loading the work (Fig. 19). Such a leaf must be closely machined to obtain accuracy for location of the drill bushing. Provision is also made to insure that the initial accuracy is not lost through wear of the parts guiding the lid. The illustration shows hardened ground screwed-on guides and rest for the leaf. Clearance between the leaf and its guides and for the hinge pin is kept to a minimum, approximately one thousandth of an inch.

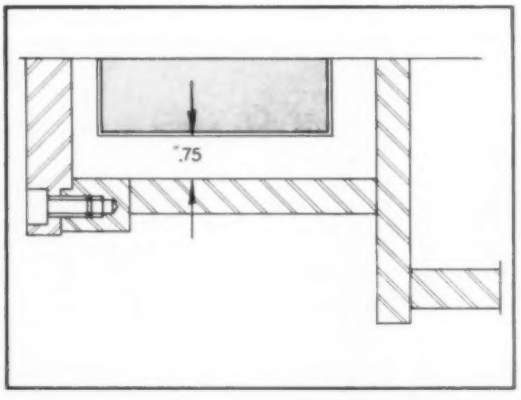
To hold a hinge leaf down on its rest, an eyebolt and handknob can be used as shown in Fig. 20. The leaf is slotted to permit swinging out the eyebolt without completely unscrewing the handwheel. The boss of the handwheel seats in a shallow counterbore, thus preventing unwanted opening of the eyebolt by vibration.

As an alternative to the eyebolt shown in Fig. 20, a clevice can be used where the job would warrant the somewhat greater expense involved.

Locking Hinge Leaves

Other methods for locking a leaf include a cam, as shown in Fig. 21. This design has the advantage of faster operation. In addition, a leaf can be simply locked in place by a latch screw (Fig. 22). The tapered head is milled off on one side; this side clears the lid for opening. When the latch is turned from this position, the lid is kept from opening and it is also pressed down due to the screw end of the latch. The milling is done in assembly, to have the milled face in the proper place. The handle is then welded-on opposite. A leaf locknut can be used to lock and hold down a hinged leaf. A stud is fastened permanently in the fixture, and the nut turned ninety degrees to lock the lid. The nut is made heavy so a hammer may be used on it.





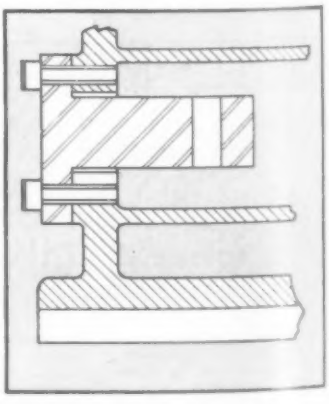


Fig. 13 (left). This two-point pusher provides a simple method of moving the work parallel toward a locator. Fig. 14 (center) illustrates a number of points in drill jig design. Proper (0.75 in.) clearance, stiffening of frame provide lightweight but rigid jig. Fig. 15 (right). A separate block, screwed to the outside of the fixture, solves the problem of drilling otherwise inaccessible holes.

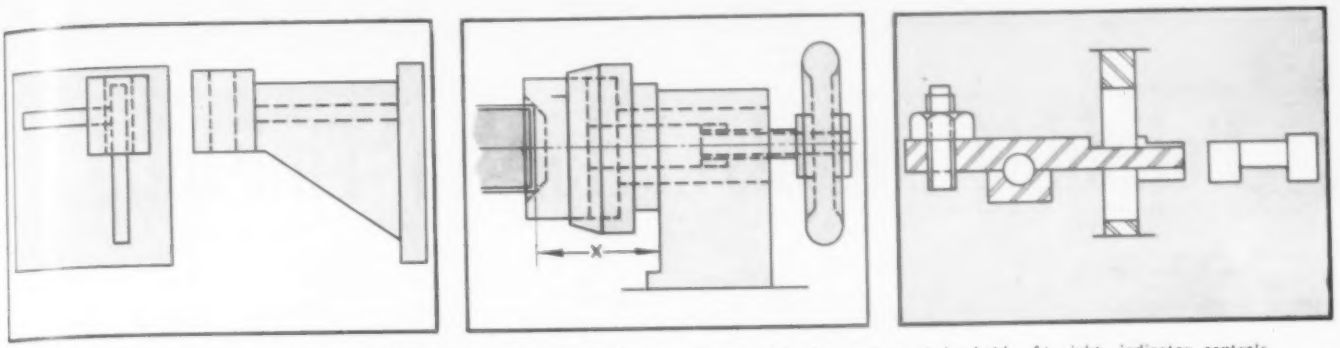


Fig. 16 (left) illustrates ribbed brackets which resist bending under fixture stresses. Two indicators are shown in Figs. 17 and 18. At center the built-in indicator measures the additional dimension X to which the work must be held. At right, indicator controls movement of work into fixture. Lever is moved by hand against work and position compared with machined block on fixture.

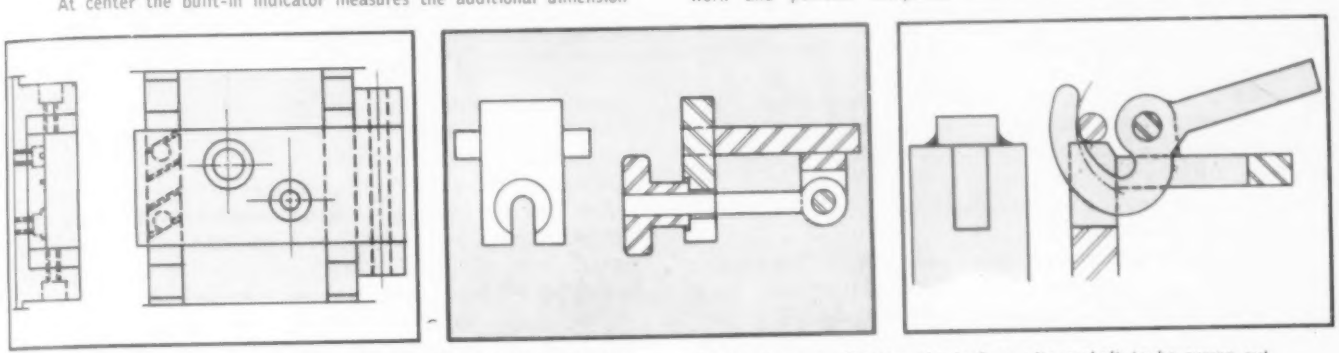


Fig. 19 (left). One application of the screw bushing is shown here, where they are designed in hinged leaf for loading work. Fig. 20 (center) shows eyebolt and handknob combination which holds hinge leaf on its rest. Slotting the leaf permits eyebolt to be swung out without completely unscrewing handwheel. The cam method of locking, shown in Fig. 21 (right) has the advantage of faster operation.

The leafrest is employed when a leaf becomes so large that it requires an effort to lift it, and it is well to provide a rest so that it will be just safely out of the way for unloading. The leafrest shown in Fig. 23 can be either welded to the fixture body or screwed on.

Case-hardened mild steel (SAE 1020) is largely used on fixtures where surface hardness and a soft core are desired. The hardness that can be obtained is approximately 65 Rc; the depth of hardness about one-sixteenth of an inch. In grinding, not more than fifteen thousandths should be removed. Holes in case-hardened pieces are frequently left soft.

Selective Hardening

Reasons for this are several: on tapped holes the threads stand up better when soft. On holes counterbored for the screwhead, a soft counterbore provides a better seat. On reamed holes reaming is done in assembly together with mating parts, and the hole thus must be soft. Pressfit is satisfactory only in a soft hole. Holes to be tapped after hardening must be soft.

Holes can be left soft in hardening, while the rest of the piece hardens, by removing the carburized case at the place in question before hardening. By drilling, counterboring, etc. before hardening, the hardenable case is removed. Near the surface, the hardened skin will come so close to the hole that it would ruin the tool and therefore such holes should be countersunk. Referring to Fig. 24, parts 2, 3, 4, the double line indicates the hardened skin. The sketch of part shows a hole drilled before carburizing, and the hard skin that is produced on the work and in the hole in this manner.

Flame Softening

Another way of softening a case hardened piece in certain spots is flame softening. In this way the tips of threads in tapped holes, where the threads were hardened, can be softened. Holes that were drilled before carburizing can yet be left soft by plugging them with clay during carburization.

Long holes should be relieved down to a depth sufficient for the function of the hole. For example, a dowel should be made of the required length but if it is buried down to a great depth the rest of the hole should be relieved; or a tapped hole should have the required length of thread, but for the rest of the hole the diameter should be larger to simplify tapping.

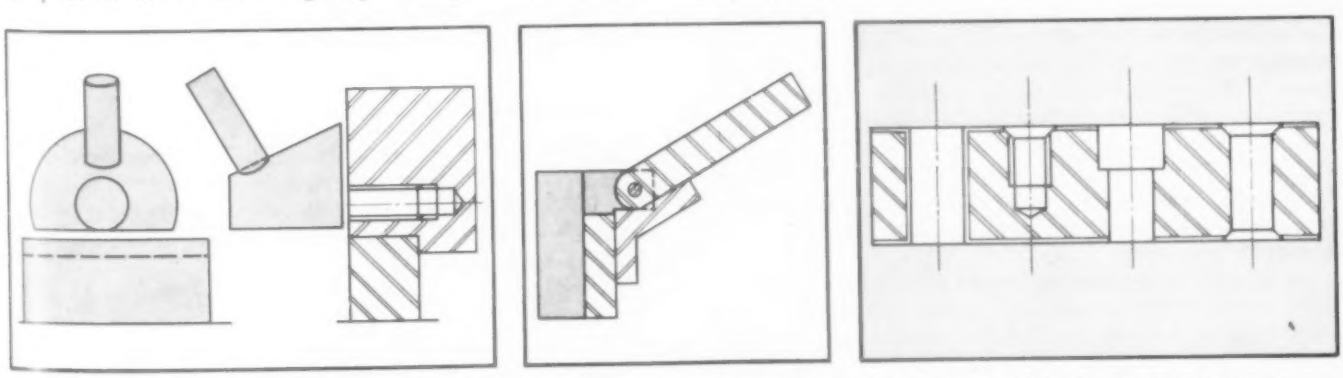


Fig. 22 (left) shows a latch screw design for locking the leaf. Fig. 23 (center) illustrates the leafrest, used to hold the leaf out of the way when it is too large for easy handling. Fig. 24 (right). It is recommended that, in most cases, the holes remain soft while the rest of the work is hardened. This is shown in parts 2, 3 and 4 (left to right) where the skin is hardened and hole is soft. Double lines indicate hardened area. Hardening is prevented by removing carburized case before hardening operation.

Polishing Metals Prior to Finishing

By Edward Engel

CONSULTING ENGINEER, COLONIAL ALLOYS COMPANY

ALTHOUGH A BRIGHT surface is desired for many decorative finishes, it is not sufficient in itself. A lustrous finish must be generated from a smooth surface if it is to have stability. It is equally necessary that a matte finish be created upon a smooth surface in order to achieve more than temporary uniformity.

It is possible to produce a mirror finish upon a very rough surface, such as is obtained by a dull grinding wheel. The wheel tends to level the high ridges and partially fill in the valleys and crevices. In a short time the bent ridges will flake off and expose the uneven surfaces. It follows that a mirror or matte finish originated from other than a smooth surface may have a short life. Therefore, it is indicated that surface smoothness and surface finish are not necessarily synonymous terms.

The polished layer of a metal is chemically less stable than the unpolished underlying sections. This polished layer is referred to as the Beilby layer, and its depth is a few hundred-thousandths of a millimeter. The Beilby layer is of a vitreous, amorphous nature, and it is harder and much more chemically active than the underlying crystalline metal.

The Beilby layer is not generated by fine grinding, since such operations remove surface sections but do not appreciably distort the underlying crystal structure. Contrariwise, polishing does not remove an appreciable amount of the surface, but "rolls" the peaks into the valleys and crevices to form the Beilby layer. And, as has been stated, this layer reacts chemically more readily than the undisturbed underlying crystal structure.

Work Hardening and Corrosion

In addition, the peaks become work-hardened by cold-working as a result of the action of the polishing and buffing wheels or belts. The work-hardened peaks, or stressed areas are anodic (of a higher potentiality) to the unstressed areas. The stressed areas, are preferentially corroded in pickling, cleaning, plating and anodizing solutions as well as under atmospheric conditions. In many instances, such corrosive attacks are sufficient to cause a loss in surface lustre.

As compared to the action of conventional abrasive polishing and buffing elements, electrolytic and "Chemical-Polishing" processes attain passivated, or non-stressed surfaces. Such surfaces are chemically more stable than those produced abrasively.

The finer the average grain (crystal) size of the metal the better are the abrasive polishing and buffing results. Since the average grain size required for efficient deep drawing operations is within the 0.035 to 0.045 mm range, such fine grain metals will tend to respond favorably to abrasive polishing and buffing. Other methods of metal forming, however, do not require as fine a grain size: in machining operations a coarser average grain size tends to procure increased machinability. Thus, it is apparent the polishing and buffing department cannot expect all surfaces to respond equally well.

Electrolytic polishing is not as sensitive to the grain size, and performs almost as well on metal with an average grain size of over 0.035 mm (which is in the better machining range) as with the finer grain in the deep drawing range.

Cleaning is another hazard in the procurement of a smooth, lustrous surface in a suitable condition for plating or anodizing.

MEASUREMENT OF SURFACE SMOOTHNESS

Some methods for the determination of surface roughness include:

1. The surface is compared with standard specimens visually or by fingernail feel.
2. By sound reproduction, using a phonograph needle and stethoscope.
3. Dual comparing microscopes such as made by Comparator Instrument Company, Detroit; Schmalz Corporation; and Comtor Company, Waltham, Massachusetts, are particularly useful for highly finished surfaces of 3-4 rms and rougher.
4. The Fax-Film method of R. W. Dill, 5109 Mayfield Ave., Cleveland, Ohio.
5. The Surface Analyzer, Brush Development Company, Cleveland, Ohio.
6. The Profilometer of The Physical Research Company, Ann Arbor, Michigan.
7. A stereoscopic microscope with a magnification range of 10x-140x, equipped with a two tube fluorescent desk lamp is useful in observing surface finishes. It is seldom necessary to have a magnification of over 50x for examining plated finishes.
8. Supersonic Reflectoscope, Sperry Products Company, for the non-destructive testing of metals.

Photographic Methods

Norton Company offers specimens of ground finishes. Replica sets of turned, ground, milled, honed, lapped and polished surfaces varying from 500 to 2 microinches are made by such firms as University Machine Company, and Check Gage Company.

According to Eastman Kodak Company, functional photography shows the way to new and faster methods, sounder products and lower costs. Some of the photographic approaches to the study of metals, finishes, and surface conditions are outlined below.

Photomicrophy is a basic metallurgical tool which enlarges the grain structure of metals up to 5,000 diameters to reveal

the grain structure. The study of grain structure provides data for improving machining, drawing, welding, grinding, and polishing performances.

Electron-micrography provides magnification of 100,000 diameters and shows the characteristics and effects of abrasion, corrosion, coatings; thus advancing the knowledge of surface protection, surface treating processes and metals and alloys.

Microradiography provides a method for studying the microstructure beneath the surface, in depth as well as in cross-section. Details such as shrinkage, porosity and phases usually masked by etching and polishing are clearly differentiated for study and reference.

X-Ray diffraction patterns on film show the identity of minute particles of material and the effect of surface processing and operations on their structure.

Stress analysis studies on film is an important method especially for the study of metal drawing operations.

Surface Finish Terminology

The terminology or conditions of finish as they affect the eye (visual aspects) are as follows:

Specular finish refers to the nearly uniform position of the metal crystals to light rays. Thus, light rays are reflected directly or nearly so, which is to say mirror-like (image) reflectivity occurs.

Diffuse finishes are surface appearances in which the crystals on the metal surfaces are irregularly positioned. Therefore, light rays falling upon such a surface will be reflected at various angles, and relatively no image can be discerned in a surface with a diffused finish.

Refraction of light means the bending of light rays. It is given as the Refractive Index of a surface.

Opaqueness is an index of light refraction and it also is stated numerically.

Color absorption by metal surface layers, also referred to as color interference, is caused by the absorption of certain waves of light and the reflection of others. This phenomenon occurs in whole or in part in the different layers on the metal surface.

Matte finishes refer to non-reflective surface appearances; although the term is generally applied to non-reflective colored surfaces. A color on a matte surface appears to be darker than it would appear on a polished surface.

Satin or butler finishes are, in appearance and light reflectivity, between specular and matte finishes.

Instruments for testing reflectivity and comparative lustres of metal surfaces are made by such firms as Comparator Instruments Company, Comtor Company, General Electric Company and others.

TABLE I—SURFACE MEASUREMENTS

Surface Roughness in Microinches	PRODUCTION METHODS	RECOMMENDED USES
500	Low grade machined surfaces.	Secondary parts not subjected to stress or concentration.
250	Medium grade machined, or very rough ground surfaces.	For general uses, surfaces under moderate tension.
100	Smooth machine finish.	Main structurals, fittings, highly stressed parts.
40	Very fine machining or medium ground.	For highly stressed parts, except extreme tension members.
20	Fine ground, smooth reamed, coarse honed or lapped, rough polished.	Extreme tension members like bearings and rotating shafts, and for work to be polished.
10	Finest grinding, honing, lapping, regular buffing and burnishing.	Cylinder bores, preparatory for fine buffing or electro-polishing.
5 or under	Honing, lapping, super finish, very fine buffing, electro-polishing, "Chemical Polishing."	Sliding surfaces as across grain friction where lubricants are not depended upon for plated work or anodized work.

ABRASIVES

Abrasives may be applied to metal surfaces as follows:

1. Cemented or bonded together to form grinding wheels, discs, cones and other shapes.

2. Cemented or glued to paper, cloth, as sandpaper and emery cloth; mainly for manual use or in sanding-machines.

3. Fine scouring powders are applied to metal surfaces in a loose form through the medium of cloth for lapping operations.

4. For polishing, abrasives are cemented or glued to various materials, as detailed in this article.

5. For buffing, stick or liquid abrasives applied to suitable elements, as detailed in a succeeding article. (Also, the same type of abrasives are applied to wire wheels.)

6. Sand, steel balls and steel shapes and other materials are forced against metal surfaces by means of compressed air or centrifugal force. The various methods for applying loose abrasive under great force are referred to as sand blasting, shot-peening or vapor-honing.

7. In tumbling (barrel) operations, sand, stone, metal and many other materials of variant textures are appropriately proportioned with the work in a suitable revolving barrel or drum. Water and other chemicals may or may not be added to obtain specific results. (A subsequent article presents details.)

The purposes of applying abrasives to metal surfaces are as follows: to wear off or remove casting-flashings, sprues, parting-lines, gates, burrs, tool marks, smear or fuzz metal, scratches and other surface defects and trimmings, as well as for the smoothing, further refinement and brightening of the surface.

The smoothness of the metal surface, in addition to its paramount importance as a foundation for polishing and buffing, is essential mechanically. For example, smooth sur-

TABLE II—TYPICAL POLISHING-WHEEL GRIT SIZES

Grit	Aluminum Die-Castings	Aluminum Sand-Castings	Aluminum Sheet	Brass Castings	Brass Sheets	Cutlery	Gray Iron	Knives	Monel, Cast and Drawn	Monel Sheet	Enamel Stock	Stainless Steel Mirror	Commercial Steel	Zinc
Al_2O_3	150	36 to 46 60 to 80	120	60 to 80	180 to 220	80	70	80 to 90	80 to 120	180	90	60 to 80	80	180
Al_2O_3	x	120 to 180	180	150 to 180	Buff	120	120	120 to 150	120 to 150	x	100	120	100	220
Al_2O_3	x	x	Buff	220	x	x	150	200	150 to 180	x	120	150	120	x
Al_2O_3	x	x		x	x	x	240	x	Buff	x	150	Buff	180	x

faces have greater safety factors against stress concentrations, fatigue failures and imposed loads (notch sensitivity). The emphasis in this series of articles, however, is on the necessity of smoothness for subsequent processing in order to achieve stable decorative finishes.

POLISHING

The purpose of polishing is to smooth out the peaks. It may follow grinding or the polishing sequence may be performed on surfaces not previously ground.

Some wrought, forged and drawn forms such as extrusions, drawings, stampings seldom require grinding. Also, well machined surfaces and die castings are polished without prior grinding. Grinding is a machining operation, as it generates a surface.

Polishing may be performed so as to generate a surface. Such an operation is, however, inefficient as it requires too much time. Therefore, the correct purpose of polishing is to obtain a further refinement of the surface than is obtainable in any other manner with equal ease. Polishing operations remove minor surface irregularities such as scratches, peaks or tool marks.

Polishing abrasives: The particle sizes and the uniformity of the abrasives are the most important elements in polishing. The particle sizes of abrasives are graded as follows: Very coarse, 6 to 12; coarse, 14 to 24; medium, 30 to 60; fine, 70 to 120; very fine, 150 to 240; powder sizes, 280 to 600 grit. (See Tables I and II for types and sizes.)

Wheel selection: The selection of the type of wheel depends on several factors:

1. Leather-covered wood or bullneck leather for fine polishing of flat work, such as cutlery.
2. Solid felts of various densities for greasing-out, dry-fining, and cushioned-polishing.
3. Irregular surfaces require a wheel with soft density, such as an intermediate grade of bleached muslin.

In general, greasing operations call for one of the following: colored muslin, sewed and cemented sheepskin, felt, walrus or bullneck leather. The specific selection depends on the metal and the regularity of its surface.

1. For greasing irregular surfaces of soft metals: colored muslin, quilted sheepskin or felt are alternate preferences.
2. For irregular steel surfaces: bullneck leather, felt or canvas.
3. For die castings: flexible bleached muslin.
4. For irregular shapes like automobile hardware: sheepskin or felt, since they can be shaped to fit the work, are selected.
5. For irregular stamped shapes: quilled wheels of thin canvas discs.
6. For firearms, cutlery and other high carbon steel parts as well as silverware: walrus hide gives the required fineness.
7. For brass: walrus, felt or sewed and cemented sheepskin.
8. For aluminum: sewed, cemented sheepskin or felt.
9. For roughing operations on cast-iron and steel and for dry-fining builders hardware: heavy canvas wheels with high warp and filler count. The lighter the pressure requirement, the lighter and more flexible the wheel.

Abrasives for Polishing

About 95 percent of the felt wheels or bobs used as set-up wheels have 4 to 9 densities. Felt wheels may be shaped or contoured for polishing irregular surfaces. Speeds of felt wheels and bobs are 6,000 to 10,000 fpm.

Roughing is a coarse abrasive polishing step involving the use of 36 to 120 mesh particle size grains. As a rule, no lubricant is used. This step is seldom applied to other than castings.

Greasing or oiling is a polishing procedure in which a lubricant is applied to the set-up wheel or belt. The abrasive is from 120 to 400 mesh. This operation, dependent on the fineness of the abrasive is further divided into greasing, grease-fining and grease-finishing.

To avoid drag in polishing aluminum or zinc die castings a liberal application of low melting point tallow must be applied. For greasing operations on steel, stainless steel or brass, an emery cake is more suitable as it has a higher melting point and heavier body which compensate for the high frictional heat generated.

Polishing equipment: In addition to the conventional polishing lathe and automatic machines, belt polishers are gaining in favor for certain classes of flat work.

Setting Polishing Speeds

Polishing belts: With belt polishing, the belt resiliency provides a cushioned face which require less operator effort and skill. Also, cooler operation and longer abrasive life occur due to the belt having about four times greater working area than set-up wheels. An abrasive belt may be operated from a conventional polishing lathe. In place of the set-up wheel, a wheel of suitable hardness and material is attached to the lathe spindle. The belt is operated between the above wheel and a backstand idler-pulley. Backstands may be attached to the floor, wall, ceiling or bench.

Horsepower requirements are greater for belt polishing than for belt grinding. The speed requirements for polishing belts are from 4,500 sfpm to 6,000 sfpm. The 24 to 36 grit belts take the slower speed, and the 120 grit belt operates at the maximum speed. The usual drive pulley is 12 in. diameter, with pulley centers at about 4 feet. Power requirements are from 2½ to 5 hp. The pulleys used for driving the polishing belt are as follows: leather for hard cutting, canvas for moderate or light cuts. Silicon carbide abrasives are used on polishing belts for soft metals like aluminum and zinc. The abrasive used in belt polishing steel is aluminum.

Work positioning: When polishing after grinding operations, the work should be positioned at 90 degrees to the position previously held by the work in grinding sequences, so that the rotation of the work places the polishing lines perpendicular to any grinding lines.

Renewing Polishing Wheels

Wheel resizing: Unless an old wheel is worn below its original sizing coat it is not necessary to resize. When an old head of abrasives is to be removed, a dressing machine and an abrasive brick or diamond tool may be used; or as an alternate, a wheel-washer may be utilized.

The steps in renewing an old wheel are as follows:

1. Remove dirt and grease in a solvent.
2. Dry.
3. Soak off old grit in hot water.
4. Dry.
5. True the wheel on a lathe.
6. Mark the direction of rotation with an arrow.
7. Coat with glue as noted above.
8. Add fine abrasives.
9. Add coarser abrasives.

When a wheel becomes glazed it may be softened as follows: (1) apply a hot 1½ in. diameter pipe to the slowly revolving wheel, at a 45 deg angle, then (2) reverse the position of the pipe, so as to form "X" cracks on the periphery of the wheel. A worn wheel may sometimes be resharpened, for temporary use, by rotating it against a wire brush.

THE TOOL ENGINEER'S *Service Bureau*

FREE BOOKLETS AND CATALOGS CURRENTLY OFFERED BY MANUFACTURERS

Blanks

Tool catalog Supplement No. 8 lists sizes and prices for line of standard blanks for pulley grooving tools and heavier duty lathe and grinder center blanks, several of these latter superseding company's former line. *Carboloy Co., Inc.*, 11177 E. 8 Mile Rd., Detroit 32.

Bolster Plates

Eght-page folder presents dimensional data on bolster plates standardized in accordance with Joint Industry Conference specifications to facilitate die interchangeability. *Danly Machine Specialties, Inc.*, 2100 S. 52nd Ave., Chicago 50.

Boring Machine

Typical set-ups and tool path diagrams illustrate brochure on recently-introduced precision boring machine for straight or contour turning and boring; includes extensive outline of construction details. *New Britain-Gridley Machine Div.*, the *New Britain Machine Co.*, New Britain, Conn.

Carbide Burs

Keller Burs and accessories plus introduction to Di-Bur (designed for use on die steels) pictured and described in recently revised 40-page catalog by *Pratt & Whitney Div., Niles-Bement-Pond Co.*, West Hartford 1, Conn.

Company History

"Ex-Cell-O in the Land of Opportunity" tells story of company's rise from small tool shop to four large factories; publication acknowledging system of free enterprise and teamwork loyalty of stockholders and employees. *Ex-Cell-O Corp.*, 1200 Oakman Blvd., Detroit.

Coolant Control

Set of four booklets tells value of filtering oils and coolants used in metal working operations as cutting, boring, etc. Discusses dollar savings in man hours, lower operating costs and higher production; solving problems of excessive rejects, coolant disposal, etc.; *Homan-Crane Corp.*, 676 Wabash Ave., Lebanon, Ind.

Couplings, Flexible Chain

Complete information on dimension data, horsepower ratings, stock and maximum bores included in 16-page catalog, C45-49, on roller chain and silent chain stock couplings, and heavy duty, made-to-order silent chain couplings. *Morse Chain Co.*, 7601 Central, Detroit 8.

Cutters, Core Drill

Description, price and specifications covered in folder illustrating line of 25 speed steel core drill cutters requiring only 4 holders. *Scully-Jones & Co.*, 1915 S. Rockwell St., Chicago 8.

Finishing

Catalog No. 60 features polishing, grinding, buffing and deburring machinery including contour finishing machines for odd or irregular shapes and a line of junior automatics for use with polishing lathes or abrasive belt machines; specifications included. *Hammond Machinery Builders, Inc.*, 1629 Douglas Ave., Kalamozoo, Mich.

Finishing Tools

Catalog No. 17 containes description and suggested uses as well as dimensions and price lists for midget mills, deburring cutters, tubing cutters, countersinks and other miscellaneous tools. *Severance Tool Industries, Inc.*, Saginaw, Mich.

Low-Temperature Alloys

Four-page folder lists all known applications and uses for low-temperature-melting Cerro alloys, plus their characteristics and brief outline of physical properties of each type. *Cerro de Pasco Copper Corp.*, 40 Wall St., New York 5.

Metal Working

For manufacturers using metal parts, brochure describes and illustrates scope of contract services available for firm, equipment and methods used, plus typical examples of firm's work. *Gilro Machine & Stamping Co.*, 2915 Ford St., Oakland 1, Calif.

Motors

Armorclad asbestos protected windings, drip-proof housing, normalized castings, centri-cast rotor and other special features pointed out by photos and progressive drawings in Bulletin No. 1524 by *U. S. Electrical Motors, Inc.*, concerning improved line of horizontal motors. 200 E. Slauson Ave., Los Angeles 54.

Motors, Single Phase

Single phase motors, capacitor start-induction run and capacitor start-capacitor run types described in bulletin No. 722, includes discussion of operation, schematics and table showing performances. *Louis Allis Co.*, Milwaukee 7, Wis.

Pastes, Selective Hardening

Folder gives advantage and methods of use of Carburit, pack-hardening paste, and Isopac, an isolating paste; graphically illustrates application. *Denfis Chemical Laboratories, Inc.*, 172 Pacific St., Brooklyn 2, N. Y.

Plastic Laminates

"Productive Formica at Work in Industry" discusses the material in its various forms and its application in wide range of work; 2-page comparator chart evaluates the 50 Formica grades on properties as water and chemical resistance, machinability, electrical characteristics, etc. *The Formica Co.*, 4613 Spring Grove Ave., Cincinnati 32, Ohio.

Rust Preventative

Laboratory tests for performance, prevention surveys, procedure for using and advantages described in brochure on Rust-Ban, preventative coatings. Also includes tables for recommendations for selection and information on use. *Esso Standard Oil Co.*, 15 W. 51st St., New York 19.

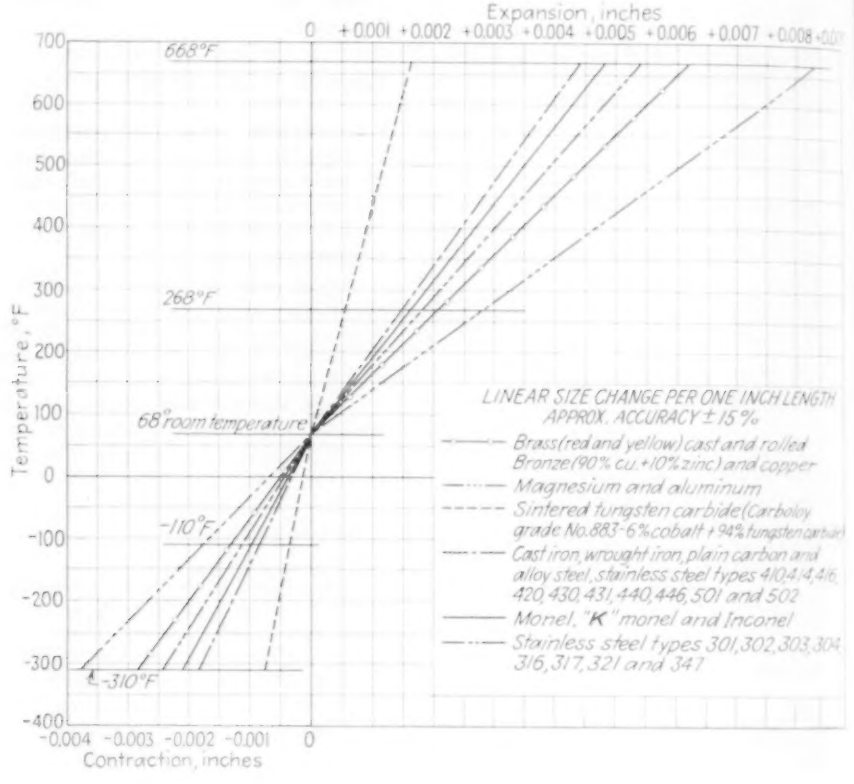
Stainless Steel

"Allegheny Metal in the Laundry Industry" uses pictures, words, charts and tables to tell how stainless has added to efficiency and growth of the business; also relates fabrication, technology and available forms of product. *Allegheny Ludlum Steel Corp.*, 2020 Oliver Bldg., Pittsburgh 22.

Steel Treatment

"Heat Treating and Pickling of Armco Stainless Steels" gives detailed recommendations for procedures; discusses general practices and equipment; suggests treatment for chromium-nickel, ferritic chromium and other types of stainless; details special methods for heat treating stainless forgings; summarizes with charts and graphs. *Armco Steel Corp.*, Middletown, Ohio.

Effects of Temperature Variations on Dimensional Changes of Metals



The table of dimensional changes of metals shown (right) may be used in two ways: (1) Using the curves, the approximate size change, per inch of length or diameter, may be determined when parts are heated or cooled. (2) The curves may also be used to determine the temperature to which a part must be heated or cooled to effect a given dimensional change.

To illustrate (1): Assume a 6 in. diameter steel shaft is to be cooled to –310 deg F. Begin at –310 deg F, follow horizontally across to the line for steel, then down to read approximately –0.0018 in. per in. Multiply this size change per inch by the diameter of the shaft. The result, 0.0018 x 6 = 0.0108 in., which represents the total size change. To determine the diameter of this shaft at –310 deg F, subtract the total size change from the diameter at room temperature. The result, 5.9892 in., is the actual diameter at the assembly temperature.

To illustrate (2): Assume a 5 in. diameter steel shaft is to be shrunk 0.005 in. for assembly. Dividing the total shrink desired by the diameter, the shrinkage must be 0.005/5 = 0.001 in. per in. of diameter. On the curve, begin at –0.001 in. and follow up to the line for steel, then across to the temperature scale. The chart shows that the part must be cooled from room temperature to approximately –150 deg F.

CALCULATION OF CHANGES

For those desiring to make calculations of changes, and for those materials not covered in the above chart, the following equations may be used.

Symbols referred to in the equations include:

ε = coefficient of linear expansion per deg F (may be obtained from manufacturer of material)

T_1 = ambient temperature, deg F

T_2 = temperature to which parts are to be heated or cooled, deg F

d_1 = diameter at temperature T_1, in.

d_2 = diameter at temperature T_2, in.

K = required size change due to temperature change, in. (When part is cooled, $K = d_1 - d_2$; when part is heated, $K = d_2 - d_1$)

T = temperature change required or effected ($T = T_1 - T_2$). Note that when parts are cooled from room temperature, T_2 becomes a minus quantity as $-T_2$. Therefore, $T = T_1 - (0 - T_2) = T_1 + T_2$.

Dimensional Change Due to Temperature Change

For Heating, $d_2 = d_1 + \varepsilon (T_2 - T_1) d_1$ (1)

For cooling, $d_2 = d_1 - \varepsilon (T_1 - T_2) d_1$ (2)

(1) Assume a ring of 10 in. ID, of a material having linear coefficient of expansion per inch per deg F equal to 0.000007. It is required to heat this ring from room temperature (68 deg F) to 500 deg F to make a shrink assembly.

Thus the inside diameter of the ring (d_2) when heated is

$d_2 = 10 \times 0.000007 (500 - 68) 10 =$
10.03024 in.

(2) It is required to make a 10 in. diameter shaft of the same material as in the preceding problem. To assemble the shaft it is decided to cool to –300 deg F.

The outside diameter (d_2) of the shaft when cooled is

$d_2 = 10 - 0.000007[68 - (-300)] 10 = 9.974$ in.

Temperature Change to Effect a Specified Dimensional Change

$$T = \frac{K}{d_1}$$

Assume a 10 in. diameter piece to be heated or cooled to effect a size change of 0.010 in. Using the same material as in the above examples, where

ε = 0.000007 in. per in. per deg F

$$T = \frac{0.010}{0.000007 \times 10} = 143 \text{ deg F}$$

—Adapted from the Tool Engineers Handbook, ASTE, 1949.

Practical Tips on Designing Vise Jaws

By R. M. Strickland

CHIEF ENGINEER
THE GEOMETRIC TOOL COMPANY

1. Keep the work as low as possible in the vise to eliminate tipping the vise jaws. Keep the cut close to the vise jaws. Avoid holding work above the vise jaws as this causes undue stress on the jaws and vise. (Use only for very light work.)
2. When holding more than one piece at a time be sure the tolerance on the work won't cause one or more pieces to be free to move. Damage to jaws or cutters may result.
3. Use jaw equalizers or castings or irregular shaped parts so that uniform clamping will be obtained. Equalizer should bear on jaw proper, and not on hinge.
4. Be sure to chamfer lower corner of fixed jaw to clear fillet usually left in vise.
5. The thrust of the cut should be taken by the fixed jaw and preferably at right angles to it.
6. All locating of the work should be done in the fixed jaw. If the movable jaw is used for locating there is a possibility of errors due to the looseness in the movable jaw of the vise. This is especially true when using old vises.
7. Locating points for the work should be as far apart as work will allow.
8. Locating points or surfaces should be as small as is consistent with proper support and wear.
9. Points subject to wear should be easily replaceable or resurfaced.
10. Study carefully the points used for locating:
    (a) Select surfaces or holes not apt to vary.
    (b) Use same locating points used for other operations if possible.
    (c) Select surfaces or holes free from burrs as this will require their removal before inserting in vise.
    (d) If burrs are present can the vise jaws be relieved to clear them to eliminate their removal?
11. Provide ejectors for work not easily removed from jaws.
12. Avoid chip pockets in locating surfaces.
13. Be sure cutters, arbor or collars will clear the vise jaws or any part of vise or jaws in their normal movement.
14. Design clamping screws, binders, etc., so they can be operated without danger of operator's hands getting caught in cutter.
15. For extreme accuracy key or dowel the fixed jaw in position.
16. Be sure to select the proper size vise. Avoid doing work beyond capacity of vise.
17. Support work well under the cut so it won't slip. Use jacks or spring plungers if necessary.
18. Consider the use of cutter setters or the equivalent to assure uniform work. Hinged type to swing out of position after locating can also be used, to advantage in some cases.
19. Use "V" locating surfaces for round work.
20. Vise jaws for square or rectangular work should be slightly undercut to bear at top.
21. Use one standard jaw if possible to keep cost down.
22. Be sure to check for ease of operation. Loading and unloading and cleaning of locating surfaces. Also for simplicity of construction and operation.
23. Countersink tapped holes in jaws to eliminate possibility of burrs.
24. Remove all sharp corners that might injure the operator's hands.
25. Relieve clamping surfaces of jaws for more holding power—serrate if necessary.
26. Provide knockout holes for all pins for replacement purposes.

Materials from Which to Make Jaws

(a) Tool Steel—Probably most desirable since the hardness is consistent through the section.

(b) Machine steel—pack hardened or case hardened. Avoid if much regrinding is to be done, as grinding will remove case.

(c) Soft jaws—machine steel or cast iron. Use only for short runs and small quantities.

NOTE: All hardened jaws should be ground on all surfaces which contact the work or the vise.
All locating points, pins, etc., should be hardened.
Avoid sharp corners or recesses that might weaken jaws or cause hardening troubles.

GADGETS

Ingenious Devices and Ideas to Help the Tool Engineer in His Daily Work

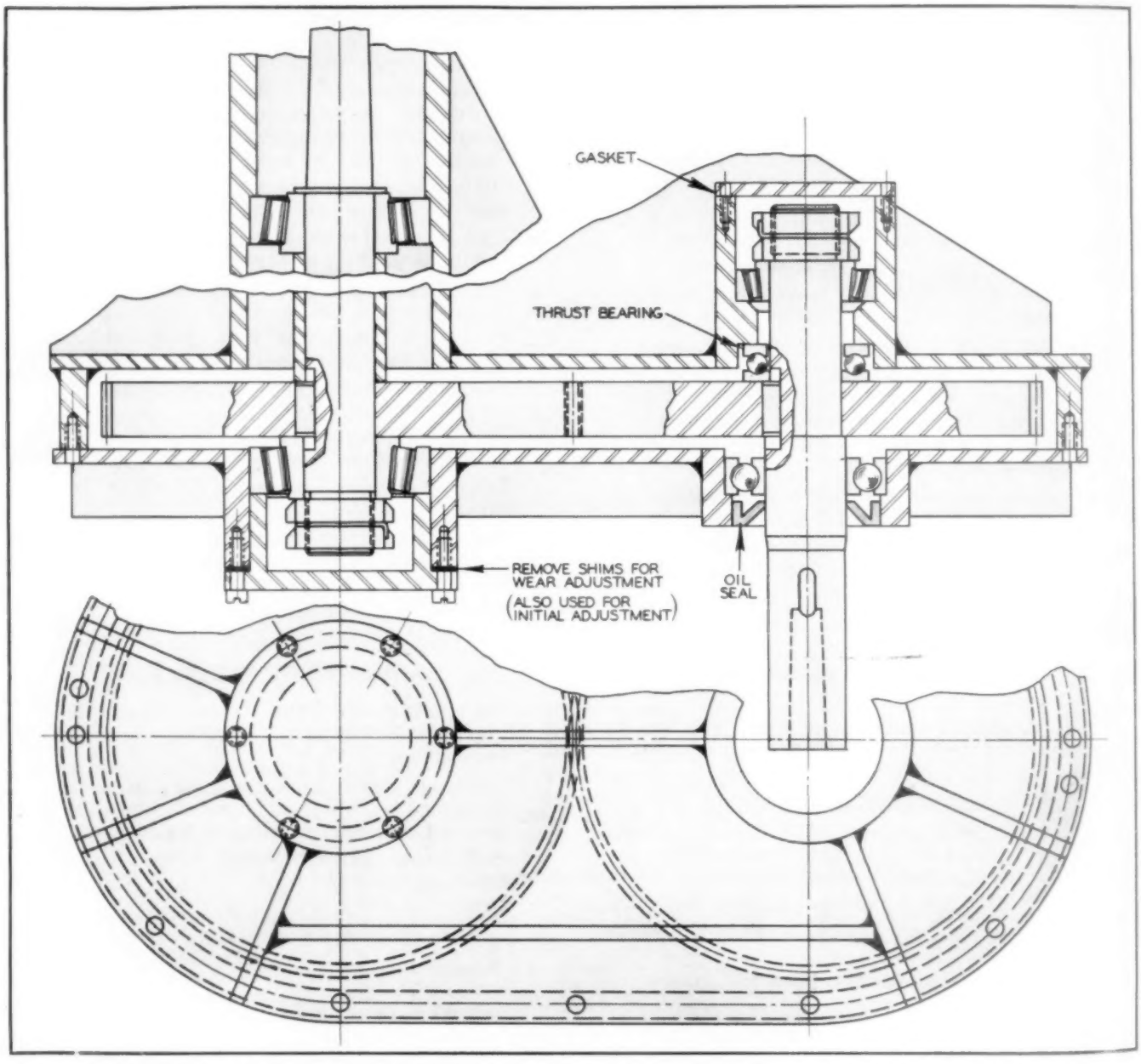
Offset Drill Head Extends Range of Drill Press

It happens that, while the shop may frequently be faced with a problem of drilling holes in normally inaccessible places, production demands might not be sufficient to warrant special equipment or machines. In such cases an offset drilling head, such as illustrated, may be constructed at only nominal cost for material and labor.

The head shown was designed and built in our plant for use on a radial drill, being attached to the quill and clamped by means of a split sleeve. The housing is an assembly composed of two weldments, machined to receive the input shaft and spindle. Drive is through spur gears, although greater quietness could have been attained from use of helical or herringbone gears; however, the spur gears have given excellent performance in our plant over a period of several years.

Roller and combination radial-thrust bearings take care of radial and thrust loads. The housing is partially filled with oil, and one oil seal is needed in addition to gaskets for the several caps. The head is driven from the machine spindle through the Morse taper on the input shaft. In addition to drilling, the head may be used for tapping, reaming, counterboring and similar operations and may be run right or left-hand as desired.

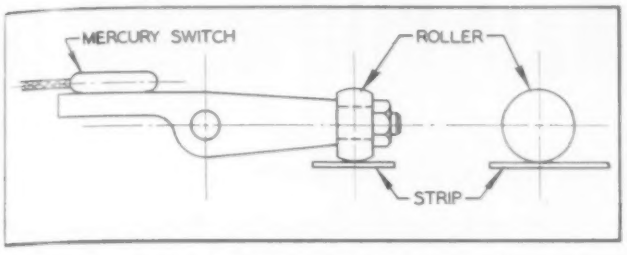
H. G. Frommer, ASTE Member
The Trackson Co., Milwaukee, Wis.



An offset drilling head permits drilling in otherwise inaccessible places. The head shown is attached to a radial drill press.

Automatic Machine Stop

Illustrated is a simple method of stopping a machine, such as a punch press, when the end of the strip which is being fed into the machine is reached. A roller, attached to one end of a rocker arm, and located ahead of the feeding mechanism, rides on the strip. A mercury switch is attached to the opposite end of the rocker and connected through a magnetic switch to the motor.



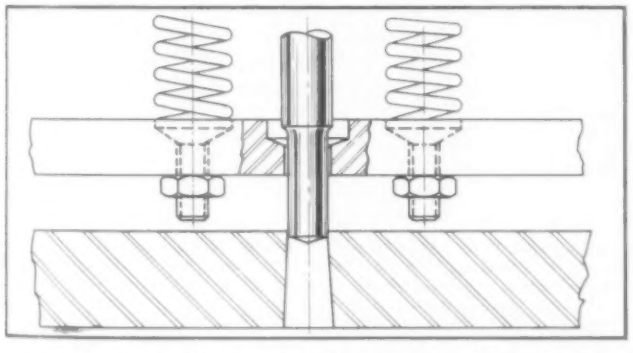
Automatic stopping of a pinch press, when feeding strip stock, may be done with a rocker arm as shown. A roller at one end rides on the strip, and when this runs out, the rocker arm tilts a mercury switch which, in turn, operates the motor switch.

When the end of the strip is reached the roller drops and causes the mercury switch to tip and thereby stop the motor. If the machine is equipped with a clutch, the mercury switch can be connected to a solenoid which can then serve as a direct or intermediate means of throwing out the clutch. This device saves tools and power and gives the operators more time for other duties.

A. H. Colombe
Little Rhody Chapter, ASTE

Adjustable Spring Stripper

By providing spring strippers with screws, as suggested in the illustration, one obtains adjustment for heavy gage material which might vary in thickness. When trying out a die, the screws may be adjusted, and locked with the jam nuts, so as to hit the part simultaneously. This keeps the stripper from cocking, which is detrimental to die life.



Odd shaped stampings, or stock having variable thickness, may be evenly stripped by providing the stripper with adjusting screws as shown.

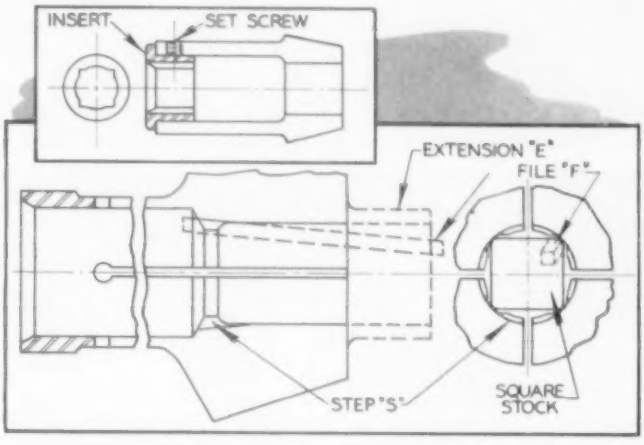
Another advantage of this adjustment is that, in parts with upsets, the screws can be set at different levels for correct functions of stripping. This type stripper will also serve as a safety feature in some cases where the operator has his hands close to spring stripper when loading and unloading the die.

Robert D. James
Rock Island, Ill.

The Tool Engineer pays regular page rates for accepted contributions to these pages, with a minimum of $5.00 for each item.

Collet for Polygonal Stock

While simple to make, the collets shown will provide adequate grip for square, hex or polygonal stock, especially so when the corners are slightly rounded. The I. D. of the collet, at front, is round and grips the stock at the corners. A bushing, at the back of the collet, is shaped to the cross section of the stock and, should there be any slippage in the grip, will act as an auxiliary driver. The bushing should be chamfered for easy entrance of the stock, and may be pressed in or retained by set-screw.



By means of a slight modification, normally standard spring collets may be made to hold square, hex or polygonal stock.

The collet shown in Fig. 1 is standard to all practical purposes, and a stock collet may be used provided that the inside diameter conforms to the distance across corners of the stock. Or, a collet with a slightly smaller I. D. may be reground in place to suit the stock, the main consideration being that the bushing should be so inset that the corners do not coincide with the slots in the collet. For square or octagonal stock, 4 slots are preferred.

In some automatics or turret lathes, the bushing inset may interfere with the feed fingers. In such cases, a step is left when boring the collet, as indicated by "S", Fig. 2. This step, which may be somewhat larger in diameter than the stock dimension across flats, is then shaped to the stock cross section. The corners may be file chamfered, as indicated by "File F", care being taken not to mar the collet bore. By turning a nose on the collet blank, as indicated by the dotted lines, Fig. 2, the slotting saw may be sunk in, leaving the very end unslotted. This facilitates cutting the last slot and also holds the collet round for grinding after hardening. The extension should then be ground off as a final operation.

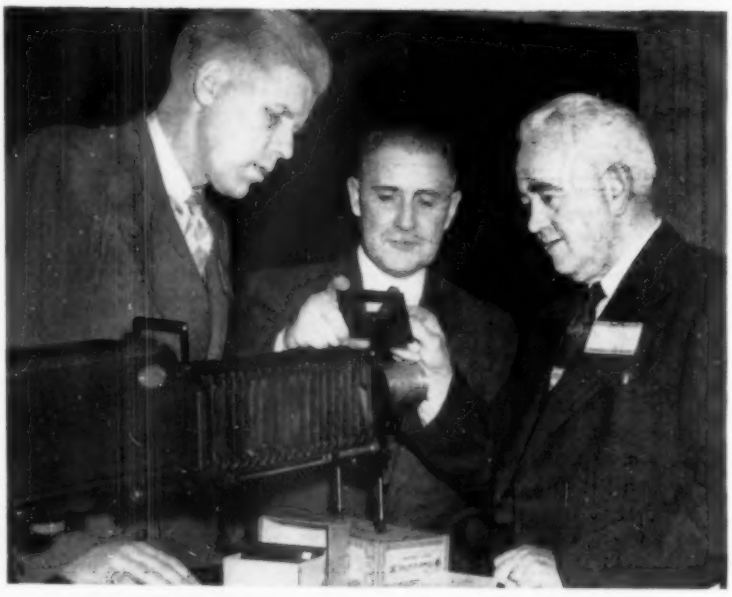
E. Rodeck
Australia

To Shape or Drill Glass

Glass sheets may be cut to shape and even drilled by comparatively simple means. To cut odd contours, first paint the sheet with dark shellac—say a mixture of shellac and lampblack. Let dry and scribe the outline to be cut, then immerse the sheet in a tub of water and cut along the scribed lines with a tin snip. The dark paint aids visibility when cutting under water.

To drill, use a brass or copper tube, the O.D. of which should be the size of the hole. Run the tube through a bushing to prevent "walk". Then, spread a paste made of carborundum, diamond or sapphire dust and turpentine around the area to be cut out, and drill. The tube-abrasive combination will "trepan" the hole to desired size.

Contributed



ASTE Convention Delegates Find

Canada Half-Billion Buyer

Montreal Technical Sessions Stress Board Approves '50 Budget, Elects

TOOL ENGINEERS from all over the United States went to Montreal to the ASTE convention. They learned what makes Canada's phenomenal prosperity tick. They were told that the nation stands ready to cooperate in hemisphere plans; that it wants more American business to balance its purchases in the United States. They were warned that Britain is making a "fierce drive" for Canada's orders of $500 million in imported tools.

Amazed at Scope of Industry

They blinked, when they saw a single engineering firm processing everything from small gear reducers to large steel rolling mills, at tooling ingenuity that enables factories making limited production runs to hold home trade in competition with U. S. volume-produced merchandise.

Even Canadian members, among the more than 600 attending the Society's 17th semi-annual meeting in Canada, October 27-29, were surprised and chesty to find that their country not only keeps up with the world but can take the lead, too. Some boasted of special techniques that give their companies U. S. markets and keep a stream of scarce American dollars flowing across the border.

Although more than 100 men were pre-registered Wednesday evening, a crowd formed at the registration

Left from top: A group of ASTE members touring Dominion Engineering Works stand in awe of a ponderous, cast steel Pelton water wheel for a hydroelectric generating unit. Before beginning his lecture, "Predesign Estimating," G. M. Foster of Northern Electric Co. discusses one of his slides with G. S. Clarke, a fellow speaker, and J. R. Houghton (left) session chairman. ASTE ladies visiting Standard Brands plant are dumfounded at the intricate machine that makes, fills, seals, tags and ejects in 5's the familiar little tea bags in their kitchens. Promptly at the 8:30 opening hour, a rush begins at the registration desk. Below: Dwarfed by partially-assembled boilers at Montreal Locomotive Works, these engineers study the water gage setup.

Industrially Mature, of Imported Tooling

Cost Reduction, Limited Production Techniques Nominating Committee, Gives Detroit '57 Meeting

By Doris B. Pratt

desk in the Mount Royal Hotel, when it opened Thursday morning. By noon 340 had gathered in the Normandie Roof for the opening executives' luncheon. This attendance far exceeded expectations and nearly taxed the resources of the maitre d'hotel. But everyone was seated and served before the program began.

President R. B. Douglas, himself a Montrealer, welcomed the Society and guests and introduced local industrialists and ASTE officers at the speakers' table. After outlining the convention program and inviting the industrial executives to send representatives to the technical sessions, President Douglas presented His Worship Camillien Houde, Mayor of Montreal. The colorful chief executive of the host city officially welcomed the visiting tool engineers to what he termed "the end of the old world, the beginning of the new." Through aid in solving its industrial problems, Mayor Houde declared, his city would benefit from the ASTE deliberations.

Britain to Start Tool Sales Campaign

Speaking realistically on industrial cooperation between Canada and the United States, Victor M. Drury, president, Canadian Car & Foundry Co., warned "it looks as though you are going to have to fight harder for our tool business. British engineers are on the eve of a fierce drive for Canadian orders."

Months ago, he related, the British engineering industries sent a delegation to Canada to survey their market. "It was, perhaps, the grimmest group of business men from the other side we have yet greeted. When that delegation returned home, the engineering industries got right down to brass tacks. Just a week ago the British government announced that it is backing this development."

The British say Canadians turn too much to the United States for engineering needs. "We are to be assaulted by a corps of top-flight British salesmen located here permanently. Those salesmen will be supported by warehouses across Canada carrying large stocks, so that they can match you in speed of deliveries."

Canada to Feel Competition, Too

This, the Montreal manufacturer hastened to add, does not mean that Canada will turn its back on American suppliers. "It does mean that we intend to weigh the new competition. Incidentally, Canadian engineering industries will face this formidable competition as much as you will. We intend to use our best efforts to meet it."

While admitting that Marshall Plan purchases have been a lifesaver to Canadian agriculture, forestry and mining, Mr. Drury emphasized that "we are not living off your fat." Canada, he informed the engineers, had its own Marshall Plan in operation less than a year after the war ended.

Under this program a nation of 13,000,000 people has contributed more than $2 billion to aid England and

Below, upper: Montreal industrialists line speakers' table at the executives luncheon. From left: S.C. Holland, president, Robert Mitchell Co.; J. E. Labelle, president, Canadian Vickers, Ltd.; V. M. Drury, president, Canadian Car & Foundry Co. and guest speaker; R. B. Douglas, ASTE president; Camillien Houde, mayor of Montreal; H. E. Conrad, ASTE executive secretary; G. B. Gordon, president, Dominion Textiles, Ltd.; and Sir Frederick Carson, executive vice-president, Montreal Locomotive Works. Lower: An ASTE technical session audience is first to hear details of a new surface measuring process developed by the automotive industry. Right: The Rt. Hon. C. D. Howe, Canada's minister of reconstruction and supply and of trade and commerce, tells banquet guests that the U.S. and Canada must continue their industrial progress and interchange of scientific knowledge and technical personnel, to solve their common problems.

other countries, in addition to nearly $5 billion worth of wartime gifts, interest-free loans and net mutual assistance.

Too many people, he pointed out, think of Canada merely as a source of raw materials. Mr. Drury appealed to the engineers "as men whose opinions are listened to" to drive home in the United States the fact that Canadian engineering industries "can back up any arrangement our two nations may make in the interest of efficiency and economy."

If Canada is to play its full part in North American defense, a peacetime Hyde Park agreement is necessary, he believes.

Sits Between Pound and Dollar

Commenting on Canada's unfavorable balance of trade with the U. S., he said, "Our position is unique. We sit between the soft sterling and hard dollar currency areas with a Canadian dollar which is something unto itself. That complicates our international trade.

"It can be balanced only if you buy much more from us or if we buy some $400 million a year less from you. While you consume over 90 percent of all you produce, we must export 35 percent to live.

"It is useless to imagine that re-establishing normal trade is the burden of government alone, of management alone, or of labor alone. Despite all theories trade is still ruled inexorably by the law of supply and demand, by the principle that awards the business to the man with the best goods at the lowest price."

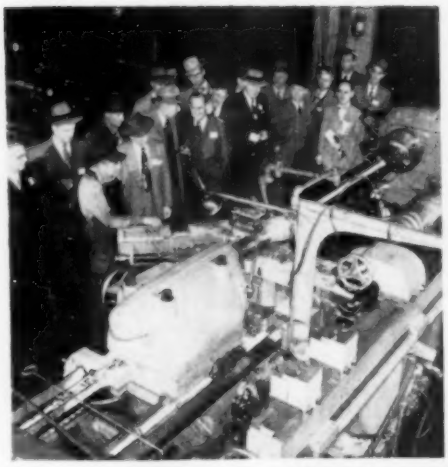
Montreal Industry Represented

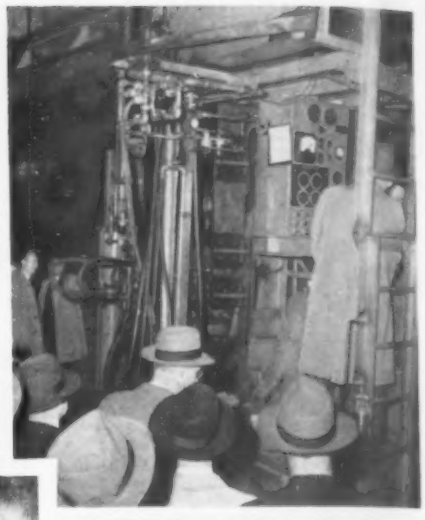
Among distinguished guests presented were: Gabriel Rousseau, technical advisor to the Minister of Labour, and L. G. Hearle, Apprentice Div., Department of Labour; J. W. Boulard, president, Stowell Screw Co., Ltd.; J. W. Fagan, manager, and C. A. Peachey, works manager, Telephone Div., Northern Electric Co.; Sir Frederick Carson, executive vice-president, and C. P. Madeley, manager, Montreal Locomotive Works.

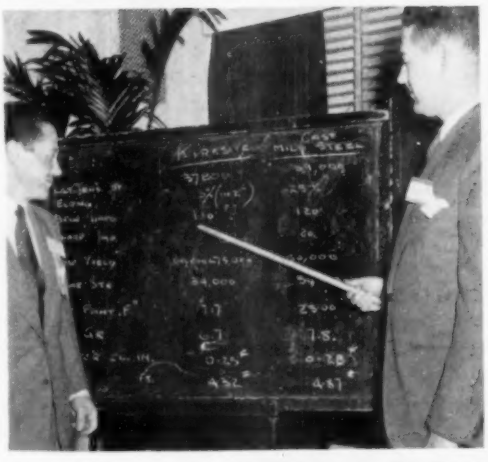
S. C. Holland, president, Robert Mitchell Co.; J. E. Labelle, president, and R. K. Thoman, works manager, Canadian Vickers, Ltd.; G. B. Gordon, president, Dominion Textiles, Ltd.; D. L. Harrington, president, Harrington Tool & Die, Ltd.; C. G. Abbey, president, Bepco of Canada, Ltd.; E. C. Kirkpatrick, works manager, and Michael Leyton, assistant works manager, Steel Co. of Canada.

Col. R. H. Muloch, assistant general manager, Aircraft Div., and Albert Jude, assistant general manager, Car Divisions, Canadian Car & Foundry Co.; D. H. Cross, manager of manufacturing, Dominion Engineering Co.; William Guston, works manager, Crane, Ltd.; A. W. Irvin, works manager, Canadian General Electric Co.; and Andrew Campbell, assistant superintendent, United Shoe Machinery Co.

The quality and timeliness of the technical program drew good attendance right through the nine sessions. Speakers were gratified with the lively interest shown and the thoughtful questions asked from the floor. Copies of papers were distributed so the audience could follow each discussion as it was presented. Additional copies are available from ASTE headquarters.







Left, from top: An operator at Montreal Locomotive Works shows tool engineers how steel axles are machined by tracer control. Carlton H. Smith indicates properties of a low melting point alloy for die work during his lecture, as A. B. Chevrier, session chairman, looks on. Visitors at Northern Electric Co. examine a small metal part for a telephone, made from the punch and automatic dies displayed. Right: A mobile spot welder joins side panels to frames of railway freight cars at Canadian Car & Foundry Co. Wing construction of transatlantic four-engine aircraft is explained by personnel at Canadair, Ltd. Another group watches turning of a chilled cast iron roll for tube mill machinery at Dominion Engineering Co.

Using the automotive industry as an example of the application of standard tool parts to cut costs, W. A. Thomas of Ford Motor Co., Ltd., Windsor, Ont., stated that standard machines are now common for all equipment used in making Ford parts. Machines not having standard parts are frequently changed over to simplify tooling, reduce costs and shorten time lost during model changes.

It is possible to produce parts from new dies the same day that the parts drawings are completed, C. H. Smith of Canada Metal Co., Montreal, told the Society, while describing the economical process of casting dies practically to shape from zinc base alloys. A wartime development of the aircraft industry, this substitute for the laborious machining of dies from steel and cast iron has been adopted by manufacturers of consumer goods.

A solution to the dilemma of choosing between the desirability of special machines to produce things faster, cheaper

Left, from top: R. P. Trowbridge, C. R. Lewis and A. F. Underwood talk shop as G. A. Rogers (right) of the National Program Committee listens. Mr. Underwood holds one of the geometric surface finish specimens around which their lectures centered. J. R. Roubik (center) is introduced by James Horne, program committeeman. Sam Tour (left) waits to follow Mr. Roubik on "Hot Machining" session. J. B. Savits (second from left) answers questions from members of audience following Limited Production symposium in which E. P. Blanchard (left) and C. D. Wright (fourth from left) participated. At right of Mr. Savits is M. G. Baker, chairman. Quality control has been developed to point where the stickiness of a surface can be designated by number, J. K. MacKeigan tells audience of tool engineers and T. J. Tracey, session chairman, at right. Center: L. G. Singer presents certificate of appreciation to W. A. Thomas for his lecture on standard tool parts at session chairmanned by Mr. Singer. ASTE'ers get a preview of the Zulia, 600-ton, first-class cargo ship launched the following day in impressive ceremony at Canadian Vickers shipyard. Unionmelt controlled welding of freight car panels highlighted Canadian Car & Foundry tour. Right: Speakers on the "Mold Die" session have a little confab after the meeting. From left: M. C. Overholt, E. W. Soitzig, J. M. Bishop, session chairman, and Islyn Thomas. A group inspects an assembly on diesel engine line at Dominion Engineering Co. Another party crowds around multiple punch and die setups for power press production of small metal parts used in electronic and radio manufacturing at RCA Victor Co., Ltd. C. P. Farr recommends adapting standard units for special machine purposes. Samuel Pedvis (left) introduced Mr. Farr.

and more accurately and the necessity of amortizing such equipment when it becomes obsolete was advanced by C. P. Farr, of Modern Tool Works, Ltd., Toronto.

Special machines, Mr. Farr recommended, should be designed and constructed from standard units which can be salvaged and used to build other special machines.

Quality control has been developed to the point where a numbering system is now used to designate the stickiness of a surface, according to J. K. MacKeigan, Dunlop Tire & Rubber Goods Co., Ltd., Toronto. This ability to specify stickiness to be maintained in production is a vital asset in the manufacture of nonmetallic products, particularly tires, Mr. MacKeigan commented.

Applied to ordinary steels and other hard metals, hot spot machining can double and even triple output, Sam Tour of Sam Tour & Co., Inc., New York, told convention delegates.

Already past the experimental stage, the process has been used successfully on extremely hard materials, normally considered unmachineable, said Mr. Tour.

Papers currently published in November and December issues of *The Tool Engineer* include: "Milling Hot Workpieces," J. R. Roubik and A. O. Schmidt, Kearney & Trecker; Limited Production symposium—"Economics," E. P. Blanchard, The Bullard Co., "Tools, Materials and Methods," J. B. Savits, Pneumatic Scale Corp., and "Quality Control," C. D. Wright, Reliable Toy Co.

Officers, directors and national committee chairmen take recess from board business for lunch. Standing, from left: L. B. Bellamy, W. B. McClellan, V. H. Ericson, R. F. Waindle, A. D. Lewis, H. C. McMillen, F. J. Schmitt, H. F. Owen, E. W. Ernst, J. O. Edmondson, R. R. Linch and H. E. Collins. Around table, from left: H. E. Conrad, T. J. Donovan, Jr., R. B. Douglas, J. J. Demuth and G. A. Goodwin. I. F. Holland joined party later.

"Mold Die Hobbing," Islyn Thomas, Thomas Manufacturing Corp., and Edmund W. Spitzig, Newark Die Co.; "Mold Finishing," M. C. Overholt, Peerless Engineering, Ltd.; "Present Methods of Surface Finish Control and Development of Geometric Surface Finish Standards," A. F. Underwood and R. P. Trowbridge, General Motors Corp.; "Calibration and Use of Master Roughness Standards," Dr. C. R. Lewis, Chrysler Corp.

"Predesign Estimating," G. M. Foster, and "Postdesign Estimating," G. S. Clarke, both of Northern Electric Co.

Chairmen presiding at the technical sessions were: L. G. Singer, Williams & Wilson, Ltd., Toronto; J. O. Horne, James O. Horne & Co., Rochester, N. Y.; and from Montreal: G. A. Rogers, Rudel Machinery Co., Ltd., A. B. Chevrier, Oster Mfg. Co., Samuel Pedvis, Upton Bradeen & James, Ltd., J. R. Houghton, Telephone Div., Northern Electric Co., M. G. Baker and T. J. Tracey, Canadian General Electric Co., Ltd., and J. M. Bishop, Accessories Manufacturers, Ltd.

National program committeemen responsible for the technical program were: F. J. Schmitt of Chicago, chairman, Mr. Rogers, who coordinated all the convention arrangements, and Mr. Horne.

It was during plant inspections that the visiting engineers really grasped the scope and stature of Canadian industry and its foreign market. Most of the factories on the tour program were large installations engaged in manufacturing capital goods or equipment to mechanize other industries.

Observers felt that equipment in the more modern plants compared favorably or was even superior to that used in similar plants in the U. S. Improvement in methods over prewar days was everywhere apparent.

Get Preview of New Freighters

At Canadian Vickers shipyard the members had a preview of two South American freighters, christened the following day in the first double launching in several years.

Mobile spot welding and Unionmelt controlled welding of railroad car side panels held the attention of the party touring Canadian Car & Foundry Co. Guests at Dominion Engineering Co. found they could not begin to see the extensive operations of this company in a few hours. Handling and processing of such varied and huge equipment as Diesel engines, hydroelectric generating units, paper and steel mill machinery predominated.

Of perennial interest, tooling for plastics was absorbing to the engineers shown through the Telephone Division of Northern Electric Co. Die work for pro-

Upper, left: Vice-president J. J. Demuth (center) introduces two new directors and their wives at banquet reception. From left: L. B. Bellamy and Mrs. Bellamy, Mrs. Demuth, and Mr. and Mrs. A. D. Lewis. Right: The Rt. Hon. C. D. Howe, Canadian government official, visits with Society officers before his address at banquet. From left: W. A. Dawson, professional engineering chairman, Mr. Howe, Mrs. R. B. Douglas, President Douglas, and G. A. Goodwin, treasurer. Below, left: I. F. Holland (right), immediate past president, congratulates A. M. Sargent as he presents testimonial to Mr. Sargent's work as building chairman during Mr. Holland's administration. Right: President Douglas expresses Society's gratitude and presents certificates of appreciation to E. W. Ernst, F. W. Curtis and B. C. Brosheer for their work in preparing ASTE's first handbook, as officers applaud. Other members of committee were not present to receive awards.

Society officers take their places at the speakers' table before the 350 members and guests attending the 17th semi-annual dinner.

ducing metal parts for telephones was another high point in this trip.

Other convention delegates lingered over the machining of steel axles by tracer control at Montreal Locomotive Works and the assembly of locomotive boilers. Press operations on aircraft parts were studied intently at Canadair, Ltd. In the Angus Shops of the Canadian Pacific Railway Co., interest centered around milling operations employed in building and repairing locomotives and other rolling stock.

Those who were guests of RCA Victor, Ltd., examined multiple punch and die setups for power press production of small metal parts, in viewing facilities for making radio and television sets and phonograph records.

Wives Shop for Bargains

While the men were learning how to get the most out of the production dollar, their wives were busy getting value plus on their shopping dollars. In French-type specialty shops, just above or below street level, and in modern department stores, they exchanged their 10 percent premium American funds for clothing, furs, jewelry, silver, Canadian handicrafts and foreign-made luxuries.

More than 100 ASTE ladies attended a fashion show luncheon at the Mount Royal, arranged by the Host Chapter Committee.

Fascinating to the women guests were yeast production, coffee roasting, an intricate tea bag machine, and other food processing and packaging operations at the Montreal plant of Standard Brands, Ltd. At the end of the tour, the management served refreshments and presented packages of tea and coffee to the ladies.

The members' wives also visited National Breweries, Ltd., Imperial Tobacco Co. and Distillers Corp.

* * *

The board of directors opened its semi-annual meeting Friday morning with the installation of four directors-elect: L. B. Bellamy of Detroit, V. H. Ericson, Worcester, A. D. Lewis, Los Angeles, and R. F. Waindle, Aurora, Ill. National Secretary W. B. McClellan swore in the new directors and President R. B. Douglas conducted the meeting.

After considering each item, the directors approved a budget submitted by Finance Chairman H. C. McMillen, totalling $161,400 plus special project funds amounting to $20,513.50. These figures do not include anticipated appropriations for *The Tool Engineer* magazine and the Tool Engineer's Industrial Exposition. The new budget represents a reduction from $204,124 appropriated last year.

Chairman McMillen also recommended increasing the Society's reserve from $70,000 to $100,000 and retiring building fund certificates at the rate of 10 percent per annum without disturbing the reserve.

Elects Nominating Committee

President Douglas nominated and the board elected the following Annual Nominating Committee: I. F. Holland of Hartford, J. H. Schron, Cleveland, Anton Peck, Los Angeles, George Exley, Baltimore, and Thomas Barber, Chicago.

This committee will prepare a slate of candidates for 1950-51 directors. From these nominees members will indicate their preferences and instruct their representatives voting in the House of Delegates next April.

F. W. Wilson, Handbook editor, was named to head a technical committee to coordinate and assist national committees concerned with technical activities. In addition the committee will service membership requests for technical information.

Detroit Gets '57 Meeting

ASTE will celebrate its silver anniversary in Detroit, birthplace of the Society. The directors accepted an invitation for the 1957 annual meeting, presented by Chairman M. O. Cox of the founding chapter.

Plans for future semi-annual meetings are indefinite, but the Program Committee was instructed to make a study and estimate a budget for a regional meeting setup.

R. R. Linch, national constitution and by-laws chairman, recommended 29 by-law amendments to correct technical inaccuracies or conflicts. The directors requested time to study the proposed changes and promised action at their April meeting in Philadelphia.

Reports of other committees accepted and acted on by the board are incorporated in the semi-annual report of the Society published in subsequent pages.

Among those answering the roll call by Secretary McClellan were: J. J. Demuth, second vice-president and director, H. F. Owen, third vice president, G. A. Goodwin, treasurer, H. E. Conrad, executive secretary; H. E. Collins, T. J. Donovan, Jr., and I. F. Holland, directors; J. N. Edmondson, education, E. W. Ernst, Handbook, W. A. Dawson, professional engineering, and F. J. Schmitt, program chairman.

H. L. Tigges, first vice-president, was

Upper: Among representatives of leading trade publications covering the convention were, from left: B. C. Brosheer, American Machinist, H. E. Campbell, Modern Machine Shop, C. O. Herb, Machinery, Guy Hubbard, Steel, and T. E. Lloyd, The Iron Age. Lower: "Andy" Rylander, The Tool Engineer's technical editor, feeds the little pig at Au Lutin qui Bouffe, amusing the ASTE party at his table. From left around table: Wilfred Pender, Mrs. Anthony Ward, Mr. Ward, Mrs. H. E. Collins, Mr. Collins and Mrs. Pender.

prevented from attending by critical family illness. Director R. W. Ford also sent regrets that he could not be present.

National committeemen absent were: J. A. Siegel, honor awards and judicial, H. B. Osborn, Jr., membership, W. J. Gamble, public relations, and R. H. Morris, building finance.

* * *

Led by two Scottish regimental bagpipers in black bearskin shakos and gay tartans, the speakers' table group made a dramatic entrance to the banquet.

Rising in unison, the 350 guests filling the Mount Royal ballroom Saturday evening, lifted their glasses in toasts "to the King" and "to the President of the United States," proposed by President Douglas.

What is back of Canada's booming economy and its outlook for the future were revealed to the banquet audience by the guest speaker, the Rt. Hon. C. D. Howe, Minister of Reconstruction and Supply and Minister of Trade and Commerce for the Government of Canada.

In ten years production and foreign trade have doubled in volume and income has tripled. Canada now ranks third in exports of manufactured goods, said Minister Howe.

Private industry, he continued, has absorbed practically all of the wartime machine. New companies have been encouraged through partial exemption from excess profits taxes; business is permitted to average its profits for taxation purposes and to make depreciation allowances on new investment. Home industry has been better integrated, with Canadian manufacturers using more of one another's products.

Despite its spectacular growth in metal working, said Mr. Howe, Canada remains an important market for imported machinery and equipment—about $500 million a year.

The $5 billion of U. S. investments in Canada "pays a bigger cash return to American investors than all other American investments abroad put together."

Common Outlook, Hope of Future

Concluding, the Canadian engineer, who has been instrumental in achieving this national prosperity, said, "No other two nations enjoy to their mutual benefit such a constant interchange and fluidity of scientific knowledge and of technical personnel. Canada and the United States should continue their industrial progress.

"In war and in peace, our problems are common problems. It has been our habit to make the resources of one country available to the other. It is this common mentality and common outlook that has bound us together in the past and that offers so much hope for the future."

In his address President Douglas referred to the mutual problems of the two countries, saying, "Our difficulties are not the kind that divide us, but those that draw us together. There is no common democracy like that of common experience. We are dedicated to the principle of sharing our industrial efficiency."

Calling members of the Handbook Committee to the speakers' table, Mr. Douglas presented certificates of appreciation from the board of directors and national officers to: E. W. Ernst, chairman, F. W. Curtis and B. C. Brosheer. Frank Martindell, Harry Crump and A. L. Potter were not present to receive their awards for five years' work in preparing the Society's first handbook.

On behalf of the Society, I. F. Holland, immediate past president, presented an

Left: J. B. Savits and Frank Leonard enjoy the view from The Chantecler in the Laurentian Mountains north of Montreal. Right: The sun-warmed pool at Ste. Adele Lodge looks inviting enough for a dip.

illuminated and framed testimonial to A. M. Sargent, chairman of the former Housing Committee. Mr. Holland complimented the recipient on his outstanding service in planning and directing the construction of the new headquarters building.

During the evening the Montreal chapter convention chairmen and their committees were thanked for making the convention a success and for their service to the delegates throughout the meeting. In charge of convention activities were: G. A. Rogers, first vice-chairman, National Program Committee, M. A. Cote, general chairman, C. A. Gareau, chapter secretary.

C. J. McDowell, chapter treasurer, A. B. Chevrier, banquet, J. M. Rudel, reception, T. C. Hill, chairman, and J. Leblanc, plant tours, J. M. Davis, chairman, and F. N. McAnulty, emergency committee, R. B. Seguin, entertainment, R. A. Byron, chairman, and J. M. Masse, registration, W. F. Stewart, transportation, H. T. Welch, meetings and arrangements, R. C. Gillespie, signs, J. P. Cloutier, tickets, and P. E. Speer, accommodations.

Laurentians Lure 200

For sheer pleasure the day-long trip into the Laurentian Mountains, preceding the banquet, was the highlight of the convention.

Favored with the bright, summerlike weather that prevailed throughout the three days, nearly 200 visitors boarded touring buses or their own motor cars for a trip northward into the winter sports land.

Between stretches of mountain, stream and outcropping ancient rock along the Laurentian shield, farms and village industries dotted the dormant fall countryside.

At Ste. Adele *en haut* the road climbed sharply to Ste. Adele Lodge and its neighboring resort, The Chantecler, continuing on to the Alpine Inn at Ste. Marguerite Station. Groups stopping at each of the picturesque tourist hotels were served mouth-watering, Canadian roast beef. After lunch the excursionists strolled about the grounds and cottages of the palatial resorts or dozed on sun decks and terraces until time to return in the late afternoon.

In a song composed en route to the tune of "Georgia Tech," E. P. Blanchard of Bridgeport voiced the sentiment of everyone who went to Canada with ASTE:

Quand nous allons au Laurentides
Nous chantons tous ensemble,
Quand nous retournons a Montreal
Nous chantons tous encore;
Et quand nous penserons avec regret au Canada,
Nous esperons y retourner quand viens un autre jour.

Upper: The Montreal convention committee gets a hand at the banquet. Front row, from left: W. F. Stewart, C. J. McDowell, R. C. Gillespie, C. A. Gareau, M. A. Cote, J. M. Davis, R. B. Seguin, J. P. Cloutier, A. B. Chevrier and F. N. McAnulty. Back row: J. Leblanc, J. R. Houghton, G. A. Rogers, J. M. Masse, and T. C. Hill. Lower: A mannequin models a smart costume during fashion show for the ASTE ladies.

Right, from left: Scotsman W. B. McClellan shows off his new tartan tam-o-shanter at Ste. Adele Lodge before boarding bus for the return to Montreal. Buses pull up at the Mount Royal Hotel to pick up 200 delegates off for a day in the mountains. Below, left: Best way to see Montreal is from top of Mount Royal in "Larry's" tallyho. Right: While other members of the tour party drowse unconcernedly on the sun terrace of The Chantecler, James Horne (center) wonders how he can talk his way out of a check which the garcon mistakenly presents for prepaid cocktails.

Semi-Annual Report

AMERICAN SOCIETY OF TOOL ENGINEERS

March–October, 1949

THE PERIOD covered by this report is one of the most vital in the history of the American Society of Tool Engineers. During this time ASTE has made striking progress in its position in the industrial world.

Outstanding among factors contributing to this progress are increased recognition given to and emphasis placed on technical aspects. These welcome developments are reflected in recent major Society activities.

They are already having an effect on broadening and intensifying the recognition accorded your Society. Their continuation and further development are a foregone conclusion and inevitably will raise the stature of the ASTE to a new high level among technical and professional societies.

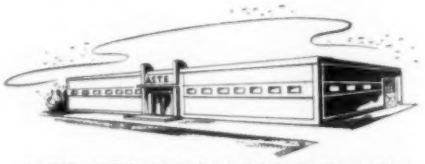
TOOL ENGINEERS HANDBOOK

Indicative is the immediate acclaim accorded the ASTE Handbook, due largely to the technical excellence of this monumental work in preparation for seven years.

Before publication, orders for some 2100 copies had been received at ASTE headquarters as a result of advance publicity on the contents of the Handbook. Since publication, orders have been coming in at a rate of more than 100 a week. If this rate is sustained, the Society's original objective of "5000 copies in two years" will have been achieved in less than half that time—before the close of the first year following publication.

This objective represents only copies ordered through the Society by ASTE members. Additional sales to non-members, according to McGraw-Hill Book Co., also are running "beyond expectancy." Actual count of these sales will be available in a sworn statement in January, when the first royalty report is due from McGraw-Hill.

The greater emphasis on high technical standards is also illustrated by types of papers and authors now being attracted to ASTE meetings. The program of the current semi-annual meeting is an example of the higher technical level of ASTE activities.



ASTE HEADQUARTERS BUILDING

Significant also is the recognition given the Society by its members from an economic standpoint. This is best illustrated by their wholehearted support in financing the ASTE headquarters building.

Building certificates totaling $100,600 were subscribed by the membership—an amount actually exceeding requirements. While a $110,000 issue of building certificates had been authorized, it soon became evident that this amount would not be needed. The reason was simply that the building actually cost less than anticipated.

Interest maturing on the building certificates during the next fiscal year amounts to $4,513.50. Definite plans are under way to start retirement of these certificates at a rate of at least 10 per cent per year.

While the Society has occupied the building for less than a year—making it difficult to project exact figures—we estimate that $12,000 will cover all building operating costs, including taxes, repairs, maintenance, gas, light and power. We believe that this figure is conservatively on the high side.

1950 INDUSTRIAL EXPOSITION

Work on the 1950 Tool Engineer's Industrial (Cost Cutting) Exposition is about a month ahead of our timing on former expositions. Publicity has been launched on an international scale with the help of foreign service agencies of the U. S. Government.

Both past and prospective exhibitors have received promotional material on the 1950 Exposition, floor plans and space applications.

All indications are that the 1950 Exposition will be at least as successful as the 1946 and 1948 shows. Exhibitor reaction has been most favorable as indicated by the return of space applications at a rate exceeding that for either 1946 or 1948.

Changing the location of the Exposition from Cleveland to Philadelphia also has met with generally favorable exhibitor reaction—exceptions so far being confined to some previous exhibitors whose normal sales activities did not extend materially beyond the Cleveland area. Some members have naturally questioned the advisability of changing the location and considerable study was given the entire question before decision to change the locale was reached.

While a number of factors were involved, the main reason was a survey indicating that ASTE could do a better job for exhibitors in a new location, particularly in view of the present high concentration, within a relatively short time, of large industrial exhibits in the Cleveland area.

EDITORIAL

Definite improvement in raising the technical level and gearing the editorial content of *The Tool Engineer* magazine to requirements of our member-readers has been accomplished in the period just past. Favorable reaction to these improvements has been shown both by the membership and by outsiders.

Members have shown increased interest in preparing manuscripts since a brochure was issued on this subject. But, much more is desired in the way of membership participation.

With regard to chapter news, the problem of trying to satisfy everyone will probably always be with us to some ex-

ent. Nevertheless there have been healthy gains in satisfying chapters on their representation in the ASTE News section.

When the Society takes over management of its magazine on December 7, 1949, the financial status of *The Tool Engineer* will be considerably improved and several other changes will be made. In addition, a more aggressive advertising sales campaign will be carried out and should contribute materially to improving our income from this source.

PROGRAM

Intensified technical activities of the Society had their inception at the Pittsburgh convention. Subsequent improvement is demonstrated in the larger number of technical sessions and the higher technical quality of papers presented at our convention here in Montreal.

As part of the Society's progress in technical matters, preprints of papers are to be available when presented, to facilitate discussion. These preprints will also be furnished upon request to those not attending conventions.

Progress on a national scale has been accompanied by an encouraging improvement in the quality of chapter programs. Chapters are scheduling better papers and with increasing frequency. With this development, it is hoped that chapter programs will soon be of such caliber generally as to provide an ample source of desirable manuscript copy for *The Tool Engineer*.

EDUCATION

Official representation of the ASTE on the Engineers Council for Professional Development has been secured through efforts of the Education Committee. This representation should be valuable to the Society in broadening its own efforts along educational lines.

One of the most vital and timely undertakings of the Education Committee is the development of a better and more complete definition of "tool engineering." Our profession has developed and is continuing to develop so rapidly that a clear, all-inclusive definition has become essential. Such a definition would be invaluable in helping educational bodies orient their efforts, aside from generally clarifying the scope of the tool engineering profession.

Scheduled for publication very shortly is the textbook on Manufacturing Analysis prepared by the Rochester Institute of Technology in cooperation with this Society. McGraw-Hill Book Co. reports that it is about to print the text.

MEMBERSHIP

Contrary to the general trend, membership in the American Society of Tool Engineers did not drop during the summer season. We believe that this is a signpost for a healthy growth of the Society during the fall and winter. With resumption of chapter meetings and increased emphasis on quality of technical papers, we look forward to greater membership activity.

In this connection, the full effect of the "Get One Member" slogan introduced shortly before the close of the past meeting season should now be felt. This slogan apparently caught the imagination of chapter membership committees and will be continued during the coming season.

To aid chapters in promotional activities directed at increasing membership in quantity and quality, a new brochure is being released. This, added to the suggestions and assistance being furnished chapter membership committees, will aid our efforts to reach this year's membership goals.

Expansion of the Society's industrial coverage also continues with the chartering of three new chapters. Waterloo Area chapter, No. 79 in Ann Arbor, Mich., includes several surrounding communities. Des Moines chapter, No. 80, is located in Iowa. A new Canadian group, Grand River Valley chapter, No. 81, has been formed at Galt, Ont.

Considerable interest has developed in the Winston-Salem, North Carolina area with every indication that a chapter will soon be ready for chartering in that district.

Efforts are being made to provide sufficient assistance at the one or two weak chapter points to help these chapters regain their strength. The potential for good, active chapters exists even at these points.

PROFESSIONAL ENGINEERING

A great deal of information and material has been collected by this committee for dissemination to interested tool engineers. It should be recognized that ASTE constitutional restrictions do not permit the national committee to take part in activities directed at influencing legislation.

Its primary function thus is to serve in a consulting capacity and to develop interest in and encourage efforts along such lines on the part of individual members and chapters. This it is doing by every ethical means available to the committee.

PUBLIC RELATIONS

Outstanding in the progress of this activity has been the increased coverage of chapter news by the local press. Newspaper clippings received at headquarters indicate greater interest in the Society generally and in the activities of individual chapters in particular—largely through the efforts of chapter public relations committees.

Nationally, although there has been a constant application of this activity, it has been carried along on a restricted basis. The recently published "Tool Engineers Handbook" and the forthcoming Tool Engineer's Industrial (Cost Cutting) Exposition provide valuable opportunities for intensifying our national public relations program.

STANDARDS

A marked increase in chapter interest has been displayed in the Society's standards work, particularly in connection with the data sheet program. During the past six months, some 16 pages of data sheets have been issued, as well as eight pages of engineering information sheets.

In addition, eight more data sheets are in preparation by the following companies: Shell Oil Co., Acme Industrial Co., Verson Allsteel Press Co., Motch & Merryweather, Cleveland Jig Co., Hydraulic Press Mfg. Co., Reynolds Metal Co., and E. F. Houghton Co.

The cooperation given by chapters makes us confident that the data sheet program will continue to grow and broaden its scope of coverage.

Organization of the ASTE-sponsored B52 Committee of the American Standards Association has been completed. Personnel of the committee, whose work concerns the classification of materials for tools, fixtures and gages, follows: Chairman, A. M. Swigert, vice-president, Universal Products Co.; vice-chairman, D. J. Giles, vice-president, Latrobe Electric Steel Co.

Secretary, R. C. Peterson, owner, Peterson Engineering Co.; recording sec-

retary, S. F. Girard, secretary to National Standards Committee, American Society of Tool Engineers; E. E. Griffiths, consulting manufacturing engineer, Parent & International Co., Headquarters Manufacturing Div., Westinghouse Electric Corp.

G. S. Wilcox, Jr., assistant factory manager, and W. H. Smila, master mechanic, Plymouth Div., Chrysler Corp.; William Moreland, production manager, Greenlee Brothers & Co.; L. B. Bellamy, district manager, Sterling Grinding Wheel Co.; W. A. Thomas, supervisor of tool engineering, Ford Motor Co. of Canada, Ltd.; Dr. John Gaillard, American Standards Association.

Dr. Taylor Lyman, editor, *Metals Handbook*, American Society for Metals; L. A. Danse, supervisor, materials and processes, production engineering section, General Motors Corp.; T. G. Digges, U. S. Department of Commerce; M. E. Cummings, assistant to the president, Crucible Steel Co. of America.

J. W. Howerton, Western Electric Co.; J. R. Townsend, Bell Telephone Laboratories, Inc.; F. O. Hoagland, master mechanic, Pratt & Whitney, Div. Niles-Bement-Pond Co.; A. G. Knight, chief engineer, Hendy Machine Co.; Mason Britton, president, Metal Cutting Tool Institute; Bureau of Ships, Code 350, Navy Department.

Thus the half-year just ended saw the successful completion of major undertakings, the launching of others and steady progress in our regular activities. We enter a new period with encouraging prospects of even greater service to our members and to industry.

R. B. Douglas

President
AMERICAN SOCIETY OF TOOL ENGINEERS

Grinding Wheel Expert Emphasizes Safety Angle

Providence, R. I.—Forty-five members of Little Rhody chapter heard Alphonse O. Rousseau, safety engineer for Norton Co., Worcester, Mass., speak and show a film on "Grinding Wheel Safety" at a dinner meeting in Oates' Tavern, North Providence, October 8.

Mr. Rousseau is chairman of the Safety Committee of the Grinding Wheel Institute, secretary of the Sectional Committee on Safety Codes for Abrasive Wheels for the American Standards Association, and consultant for Norton Co. on customer problems relative to safe grinding wheel speeds.

His informative talk and the accompanying motion pictures included object lessons and remedies concerning the use and care of grinding wheels.

Chairman Delbert Krahnke announced the opening of the second year tool design course conducted by the Rhode Island State College Extension Service in cooperation with the chapter. The curriculum, he added, has been reduced from five to four years.

Industry Plans to Buy More Equipment in 1950 To Cut Production Costs, ASTE Survey Reveals

Detroit, Mich.—Industry is determined to reduce its costs in 1950 with increased purchases of more efficient production equipment, according to a survey just completed by ASTE.

This study of buying trends was conducted in connection with the Society's Industrial Cost-Cutting Exposition at Philadelphia next April, through questionnaires submitted to the membership.

The survey indicates that 79 percent of the larger companies, 55 percent of medium-sized companies and 28 percent of the smallest firms plan to buy more than in 1948. This averages 45 percent for all groups surveyed. Of the remainder 35 percent will purchase about the same amount as last year, 7 percent will buy less, and 13 percent will make commitments for "very little."

Emphasis on Tools to Cut Costs

In a breakdown of type of equipment to be purchased, 86 percent of the larger companies plan to acquire new machine tools to reduce present manufacturing costs; 78 percent expect to buy accessories to modernize existing equipment and 57 percent will increase material handling facilities.

Of the medium-sized group 75 percent want new types of machines, 66 percent, accessories, 48 percent, replacements of obsolete equipment, and 27 percent, new materials handling equipment.

Reasons for purchasing new machinery and tools are fairly evenly divided among the smaller companies reporting, with modernizing of existing equipment predominating. In the latter classification 22 percent plan purchases of new materials handling equipment.

Thus, 64 percent of all companies surveyed plan to buy new machines and to modernize present equipment; 54 percent expect to order replacements; and 27 percent, new materials handling equipment.

On a dollar basis 52 percent will spend the largest portion of their budgets for new machines; 26 percent will use most of their appropriations in modernizing existing equipment; 12 percent will put their biggest outlay into replacements; and 10 percent will concentrate on materials handling facilities.

The study, according to H. E. Conrad, ASTE executive secretary, was made to provide a factual guide in planning the Society's 1950 exposition.

Represents Pacemakers

"The needs of our members," Mr. Conrad observed, "are the needs of industry in general. Of course, the ASTE membership represents the more progressive companies who have made it a business to assign men to the job of tool engineering—the specifying and selection of processes and equipment.

"Expansion figures in these findings, too, as a number of companies report that they are planning the tooling of complete new plant setups to manufacture new products.

"It is not unlikely that competition may force the more conservative companies to follow suit in bringing their equipment up-to date.

"One more point," Mr. Conrad added, "might be mentioned in connection with our study—an increase in the average time allowed for amortization. Some 68 percent of companies reporting indicate that they will be satisfied if the equipment pays for itself in two years or more. Over half of these are figuring on buying equipment even if it takes three years or more to earn its original cost.

"This proves that a sizeable portion of industry is deadly serious about this job of cutting costs in the coming year."

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Inset: Taking the oath of office from National Secretary W. B. McClellan are, from left: Wallace Hollinsworth, treasurer, Clyde Allen, secretary, W E. Huffman, first vice-chairman, and John Speck, chairman, of the newly-chartered Des Moines chapter. Below: Some of the charter members who attended ceremonies.

Des Moines Tool Engineers Receive Chapter Charter

Des Moines, Iowa—Sixty tool engineers representing 16 industrial plants in the Des Moines area were chartered October 18 as Des Moines chapter, No. 80, during a dinner meeting at Hotel Kirkwood.

John M. Speck, temporary chairman, opened the meeting and introduced the chartering officer, W. B. McClellan, national secretary of the Society. After conducting an election of officers, Mr. McClellan installed the following:

Chairman, John M. Speck, tool engineer, and first vice-chairman, William E. Huffman, chief tool engineer, Solar Aircraft Co.; second vice-chairman, William G. Ringgenberg, design engineer, Maytag Co., Newton; secretary, Clyde Allen, tool engineer, C. E. Erickson Co., Inc.; and treasurer, Wallace Hollingsworth, buyer, Maytag Co.

Mr. McClellan then presented the charter and a chairman pin to Mr. Speck.

Discusses Society Benefits

J. J. Demuth, second vice-president, spoke inspiringly of the value of ASTE membership in developing the individual tool engineer and in contributing to industry in general. He outlined the organization and operation of the Society and its functions as defined in the constitution and by-laws.

H. E. Conrad, executive secretary, explained the role the headquarters office plays in coordinating chapter activities.

E. W. Dickett of Rockford, Ill., a former national officer, also was present and helped get the new chapter off to a good start.

Charter members include: A. Bovenkamp, Lehman E. Anderson, Clifford A. Conn, Eugene E. DeHartog, Kenneth C. Hanks, Paul M. Keyes, Dale O. Larson, Kenneth F. Levengood, Thomas M. Logan, Clifford R. Love, James B. Martin, M. Kieth Nielsen, John J. Roberts, Russell R. Simons, Ellis G. Stephenson, Arthur E. Sweet, LeRoy Veenstra, John W. Wickenkamp and William D. White, Maytag Co., Newton.

William K. Atkinson, Iowa Machinery & Supply Co.; Henry A. Blessing, Norton Co.; Albert Elliott, Robert L. Brewster, Donald O. Frye, Kenneth L. Swords and Earl F. Volkamer, C. E. Erickson Co., Inc.; Thomas H. Hauke, Woods Brothers, Inc.; George G. Plager, Jr., Clifford L. Agee, Herbert V. Bullis, Howard E. Campbell, Hal W. Cooper, Melvin P. Fankhouser, Loren O. Hollanquist, Dwayne A. Johnson, Quinton G. Quinn and William S. Roush, John Deere Works.

C. A. Bailey, Lee R. Bailey, Clarence H. Eastwood, Eugene R. Emmons, Edward H. Gunton, Curtis E. McNay, Walter E. Schmidt, Duard W. Sexton, Henry J. VanMeter and James L. Wilson, Solar Aircraft Co.; George E. Denton, J. I. Case Co.; Everett L. Dixson, Lennox Furnace Co.; Robert G. Eldridge, Eldridge Welding & Machine Co.; Arthur W. Green, Arthur W. Green Co.; Clifford W. Helstrom, Globe Machinery & Supply Co.

Harold Leisey, Beam Manufacturing Co.; Sam Trotter, Parsons Co.; Theodore T. Warywoda, West Des Moines Die & Tool Co.; A. A. Watkins, tool and die manufacturer.

Haimbaugh Cites Benefits Of Electric Heat Treat

Richmond, Ind.—"Induction and Dielectric Heating Applications in Industry" were described for Richmond chapter members by O. L. Haimbaugh, General Electric Co. representative, at a chapter meeting in the First English Lutheran Church, October 11. He was introduced by First Vice-Chairman Pierre C. Perrine.

Slide films illustrated Mr. Haimbaugh's remarks on cost saving, heat treating and brazing operations and benefits of dielectric heating. A question and answer period followed his talk.

Chairman P. C. Hermansdorfer opened the meeting and Rev. Raymond Harris of the First Christian Church gave the invocation. Approximately 45 members and guests were present.

ASTE to Manage *The Tool Engineer*

Detroit, Mich.—Effective December 7, the American Society of Tool Engineers will assume active publishing management of its official publication, *The Tool Engineer*.

Editorial and business offices of the magazine are being moved to the Society headquarters building at 10700 Puritan Ave., Detroit 21, Mich. Advertisers will send copy instructions to this address, but will continue to mail plates to *The Tool Engineer*'s publication offices at 239 E. Chicago St., Milwaukee 1, Wis.

The staff will include: Gilbert P. Muir, editor; Andrew E. Rylander, technical editor; Doris B. Pratt, A.S.T.E. News editor; Clarence T. Etter, advertising manager; Austin G. Cragg, New York regional manager; James E. Hartnett, Chicago regional manager, and Henry & Simpson, West Coast advertising representatives.

Allen R. Putnam, formerly of the advertising staff of *Plating*, joins the staff as business manager, along with other new personnel.

With publication of the December issue, Robert B. Powers completes his five-year contract to publish *The Tool Engineer*. Mr. Powers plans to expand his present publishing activities in the automotive and florist fields. James Curran, Jr., present production manager of *The Tool Engineer*, will continue with Powers & Co. and Robert Steiger, art director, will become associated with a Detroit art studio.

Navy Man Gives Insight Into Radiological Warfare

San Diego, Calif.—"An Introduction to Radiological Warfare" was presented here recently by Lt. Louis Spadone, executive officer, Fleet Training Center, U. S. Naval Station. Lieutenant Spadone spoke before 80 San Diego chapter members and guests attending a dinner meeting, October 18, at Imig Manor Hotel.

In his illustrated talk Lieutenant Spadone reviewed the development of radiological warfare, although details of the nature of the atomic bomb have not been released. He also discussed general principles used in the application of atomic energy, materials and their chemical properties.

A color film of the Bikini atomic bomb experiment followed his talk.

Montreal Convention Papers Available

Preprints of technical papers presented at the ASTE Montreal convention, October 27-29, are available from national headquarters of the American Society of Tool Engineers, 10700 Puritan Ave., Detroit 21, Mich.

These are offered without charge, but for copies of lectures presented at future national meetings of the Society, the board of directors has authorized a nominal charge to cover handling costs.

Carbide Recommended As Boring Bar Material

Philadelphia, Pa.—From the earliest examples in flint and bronze to the present carbide types, tools have been the means of lowering costs of products, P. M. McKenna, president of Kennametal, Inc., pointed out to a group of 210 tool engineers and guests attending a meeting of Philadelphia chapter, October 20, at the Engineers Club.

While discussing "Characteristics and Principles of Carbides," Mr. McKenna cited the value of hard tungsten-titanium carbide crystals as anti-cratering ingredients in carbides. Because its modulus of elasticity is 2½ times greater than steel, carbide was suggested as a boring bar material.

Mr. McKenna also outlined advantages of mechanically held solid carbide cutting elements and a multiplicity of cutting edges. Slides illustrated points discussed. A lively question and answer period followed the talk.

Frank DeFrates offered the invocation before dinner and the Ferko String Band entertained during the meal.

Educators Attend

Guests from educational institutions included: L. N. Gulick, dean at Pennsylvania University; J. S. Moorehouse, dean of Villanova College; J. H. Billings, dean of Drexel Institute of Technology, and Howard Gross, dean of Spring Garden Institute.

H. W. Maiocco, G. A. Schmidt and Charles Fees, recipients of chapter scholarships, were dinner guests of the chapter.

Support of the Red Feather drive was urged and members were reminded of the Society membership drive and the sale of the "Tool Engineers Handbook." Kenneth Riddle spoke of the necessity for member cooperation in putting over the Society's exposition and convention at Philadelphia in April.

Emil Kitzman, chairman, showed color films of the chapter's June outing.

Automatic Air Braking Demonstrated in Film

Columbus, Ohio—"Operation of Automatic Air Brakes" was described to Columbus members by E. P. Rhodes, industrial sales engineer of the Bendix Westinghouse Co., Elyria, Ohio.

Lecturing before the chapter, October 12, during a dinner meeting at Hotel Fort Hayes, Mr. Rhodes showed an animated film of the mechanics of an automatic air brake system. He also gave a commentary on a series of slides depicting air-operated jigs and fixtures.

Guests included G. S. Wilcox, Jr., a national director of ASTE, and S. F. Girard, secretary to the National Standards Committee. Mr. Wilcox discussed a definition of a tool engineer and the Society's accomplishment in having it included in new editions of Webster's dictionaries. Progress of "Tool Engineers Handbook" sales was reported by Mr. Girard. Several members purchased copies during the meeting.

Optical Instruments Speed Jig Setups

Seattle, Wash.—How to measure displacement plus or minus 0.001 in. at a distance of 80 ft was explained to 50 Seattle members at a meeting October 11, by Boyd K. Bucey, chief tool design engineer at Boeing Airplane Co.

Although relatively new to the American aircraft industry, the collimator and optical micrometer have had limited application in England for several years, Mr. Bucey commented as he described and illustrated the use of these instruments.

By sending a beam of parallel light rays through two successive graticules or targets, viewed through a telescope, the collimator can measure angles of tilt from five to eight times more accurately than previous mechanical methods.

The optical micrometer, based on the principle that a light ray is displaced in passing through an optical flat, measures displacement in any plane approximately ten times more accurately than other methods, according to the speaker.

"When these instruments are intelligently used on jigs specifically designed for them," said Mr. Bucey, "they reduce setup and checking time, eliminating costly and awkward gages."

This enlightening talk is typical of future programs planned by an active program committee and chapter officers.

Rickert, Sales Chief

Detroit, Mich.—Clyde F. Rickert of Detroit chapter has been appointed head of the sales program for Aviation Tool & Gauge Co., Detroit.

Prior to this assignment, Mr. Rickert served 11 years with Ford Motor Co., followed by seven years at Firth-Sterling Steel & Carbide Corp.

Education Committee Sponsors Student Lecture

Philadelphia, Pa.—The entire student body of the evening tool and die design classes at Spring Garden Institute attended a technical meeting sponsored by the chapter Education Committee at the institute, November 1. Members of the chapter also were present.

Howard W. Gross, dean of the institute, introduced the speaker, Arthur C. Jackson, president of Jackson-Walker Co., Philadelphia. Before discussing "Tooling for Short Run Production," Mr. Jackson questioned students concerning their daily work in order to help them in their problems.

Suggests Fixtures for Drilling

For short run drilling problems he suggested using a Mead clamping fixture on the drill press. If the parts are irregular in shape, he added, Cerrobend or some other low-melting-point alloy makes an inexpensive holding fixture. At the end of the run, the metal used can be melted in boiling water and reclaimed for future use.

These alloys he also recommended for making jigs and forming tools, showing samples of such applications.

Other points discussed included casting, foundry practices and pattern perforation corner notching and side notching of metal. For the latter procedure Mr. Jackson recommended Whistler adjustable dies, demonstrating with a sample of the new magnetic type setup for this equipment.

During his lecture the speaker was constantly interrupted by questions from the students. Practically the entire class remained to examine the models and to question Mr. Jackson further on specific problems.

Top: A new tool, the optic instrument, was introduced to 50 members and guests of Seattle chapter by Boyd K. Bucey of Boeing Airplane Co. at a recent meeting. Center: Part of the group of 210 Philadelphia tool engineers who turned out to hear P. M. McKenna of Kennametal, Inc., discuss carbides. Bottom: Arthur C. Jackson of Jackson-Walker Co. tells Spring Garden Institute students about "Tooling for Short Run Production" in lecture sponsored by Philadelphia chapter education committee.

OUR SOCIETY

By Harry E. Conrad

Our Montreal meeting was just simply marvelous. This is actually a case of where words fail to do justice in telling of the perfect job that was done by everyone who had any connection with the convention. Even the hotel management and their employees were superb. Top praise must go to the speakers on our technical programs. They did an outstanding job.

We can be particularly proud of our own ASTE members who took part. We can all hold our heads just a bit higher as the result of the job done by our President, Bob Douglas. He certainly provided great leadership and inspiration.

Spirit of Good Fellowship

Conventions certainly provide a good common ground for the exchange of a lot of good fellowship as well as the serious aspects such as technical sessions, plant tours and so forth.

One of the good aftermaths of the convention has been reported by Joe Brenner, who is the manager of the Manufacturing Engineering Div. of Sperry Gyroscope Co. and who, by the way, is the ASTE representative on the American Standards Association's Committee B-17.

The report which Joe gave upon his return was so well received by the management of Sperry that they are going to give it a good bit of publicity in the writeup which will be published in the Sperry Gyroscope house organ. We understand that this house organ has about a 15,000 circulation within the company and another 15,000 among its customers and suppliers. This ought to be a real good plug for ASTE.

I have always been particularly interested in looking over the chapter meeting notices sent to national headquarters. It seems as though the success of a chapter can be judged pretty much by its meeting notice.

While I am anxious to see every chapter use the form recommended by headquarters, it does not necessarily follow that those chapters who do not use the standard meeting form have poor programs or bad chapter operations. As a matter of fact, it is most encouraging to see the originality and good, clear thinking expressed in some of the chapter notices.

Many of our chapter chairmen show clear and concise understanding of their responsibilities. They are workers and doers and that's what it takes. We all have a definite responsibility to contribute something to the profession from which we gain our livelihoods.

It's just like the farmer—he must plow something back into the land from which he makes his living. If he doesn't it's only a few short years until he has a run-down unproductive farm which will no longer provide him a living.

Show Space Nearly Sold Out

At this time approximately 75 percent of our space has been reserved for our Tool Engineer's Cost Cutting Industrial Exposition to be held in Philadelphia the week of April 10, 1950. It looks like a sellout and it looks like the biggest and best convention ever. I can assure you now that you will make no mistake in finalizing plans right now to be in Philadelphia the week of April 10, 1950.

This will be our second Christmas in our new headquarters building and we still think it's the best Christmas present the Society could give its members. So, from all of us here at the national office to all of you—a very Merry Christmas and a Happy and Prosperous New Year.

NOTICE

As of December 7 the editorial and business offices of *The Tool Engineer* will be located at ASTE Headquarters, 10700 Puritan Ave., Detroit 21, Mich.

Plastics Made to Suit Application—Connelly

Poughkeepsie, N. Y.—W. J. Connelly, manager, Consumer Relations Div., Bakelite Corp., New York City, spoke to members and guests of Mid-Hudson chapter, October 11, on "The Modern Approach to Plastics in Our World Today."

While no one plastic will answer all purposes, Mr. Connelly stated through research, engineering, development and design, the plastics industry can produce a material to meet almost any requirement. The age of plastics is here and its limits are man's ingenuity, Mr. Connelly added.

Displaying a variety of plastic articles, the speaker described in detail the manufacturing processes entailed. These items included Pliofilm, 0.004 in. thick and held to a tolerance of plus or minus 0.0002 in., and burnproof Vinylite wire insulation which allows more wires through a conduit than previous materials.

Used to Reduce Die Marks on Steel

Among other plastic parts shown were laminations used for spur gears, decorative purposes, concrete forms, and surface coatings. A strippable plastic surface coating applied to flat sheet steel before drawing, Mr. Connelly pointed out, will reduce die marks to such an extent that it is possible to achieve in one draw what formerly required three.

Prior to the business and technical session Ralph T. Waterman, local ornithologist, chairman of the local Forest Practice Board of the New York State Conservation Department and a member of the National Ornithologists Union, spoke briefly on "Winter Birds of Dutchess County."

Chairman Joseph L. Petz presided and introduced the following new members: Arthur T. Charter, Frank Kopf, Joseph C. Nelson, John C. Luhmann, A. G. Pizzarelli and Joseph H. McManus, representative of the International Business Machines Corp. affiliate membership.

Rhodes Cites Economies Of Automatic Air Brakes

Fort Wayne, Ind.—October 13 was guest night at Fort Wayne chapter. Following dinner E. B. Rhodes, industrial sales representative from the Bendix-Westinghouse Automotive Air Brake Co., described the use of Robotair in tooling setups.

Quoting figures on applications, he showed the engineers and their visitors how production can be increased without additional operator fatigue. When Robotair systems were installed, parts costs in plants cited took a tremendous drop, according to the speaker. Labor economy and safety also were apparent.

An animated motion picture depicting the continuity of the air brake system employed in the trucking industry supplemented Mr. Rhodes' talk and lantern slides.

"Professor I.Q." T. J. Donovan, ASTE director, presented his "Silver Dollar Quiz," based on heat treating questions.

Paul Weitzman reported on the status of the Registered Professional Engineer in Indiana. As the registration system is set up, tool engineers must qualify on the same basis as mechanical engineers, he said.

Repeats Drilling, Tapping Lecture at Montreal

Montreal, Que.—Herman Goldberg, chief engineer of the Snow Mfg. Co., Bellwood, Ill., made a return appearance before Montreal chapter, October 13, with his lecture, "Drilling and Tapping," presented last year to the members. An audience of 120 members and guests heard Mr. Snow at the October meeting in the Canadian Legion Hall.

T. C. Hill introduced the speaker and J. R. Houghton thanked him. A buffet lunch was served at the conclusion of the session through the courtesy of A. R. Williams Machinery Co., sponsors of the program.

Buffalo Members Visit Canadian Neighbors

St. Catharines, Ont.—Several years ago Niagara District chapter travelled to Buffalo to meet with their fellow members there. On October 6 the Buffalo-Niagara Frontier chapter returned the visit with more than 100 members of the two groups present for a joint dinner meeting at Charlie's Restaurant, Stamford Centre, Niagara Falls, Ont.

L. E. Everett, vice-president of Lester B. Knight & Associates, Chicago, consulting engineers, read a technical paper, "Casting Design and Its Relation to Quality and Cost."

Full cooperation, Mr. Everett stressed, is necessary between designers, pattern makers and foundries in order to produce any cast object economically, quickly and efficiently. Slides shown included machine beds, excavator and jet engine parts.

Illustrations revealed several castings with their ancilliary patterns before production had been studied from an economic view and after redesigning to facilitate less costly casting. In one case pattern pieces had been reduced from 14 to 5.

Following the question period at the end of Mr. Everett's talk, Norman Coleman, chapter chairman, thanked the guest speaker for his presentation.

Erwin A. Slate, chairman of the Buffalo ASTE chapter responded to a recognition of his delegation with an invitation for the Canadian group to revisit the American border city.

Fishback in New Post

Rochester, N.Y.—Philip G. Fishback, formerly of Graflex, Inc., has been appointed chief inspector and head of quality control of the Metals Div. of White Sewing Machine Co., Cleveland, Ohio. Mr. Fishback has just completed five months of special assignments and surveys for E. J. Sebek, assistant vice-president and works manager of that company.

A member of the Rochester ASTE chapter, Mr. Fishback has contributed articles on inspection and sampling to *The Tool Engineer*.

Left: E. B. Rhodes of Bendix-Westinghouse Automotive Air Brake Co. tells Fort Wayne chapter how production can be increased without taxing operators, by use of automatic air brakes. Below: T. J. Donovan (right), who presented quiz show on same program, has a member on the spot with a heat treat query.

Executives Told Plans For Attracting Industry

Kansas City, Mo.—Eighty-five members and guests attending Kansas City chapter's annual executives night learned what their city is planning to promote its industry.

As guest speaker L. P. Cookingham, city manager, outlined the municipal program during the chapter's November 1 dinner at the Advertising and Sales Executives Club.

Considerations for attracting new industry, said Mr. Cookingham, include such employee interests as cultural, transportation, housing and recreation facilities.

K. N. Macomber, chief service engineer, Lapointe Machine Tool Co., Hudson, Mass., discussed broaching, showing films on broaching automotive and jet engine parts.

In explaining electrolizing Mr. Macomber pointed out that the broach is subjected to high current to refine the structure of the metal, then a thin layer of rare metal is deposited on the tool to give it a hard surface.

Radioisotopes in Industry

Jerome Brewer of the Midwest Research Institute, Kansas City, told the chapter how radioisotopes are used in industry in a discussion and demonstration before 40 members and guests, October 5.

Using radium, Mr. Brewer showed the operation of a Geiger counter. A scale, he explained, is used to arrive at a minimum of equipment required to detect any radioactive substance.

The counter is so sensitive that it will detect electron radiation from K-40 atoms, about 0.018 per cent of all potassium. For every unit of count on the instrument, Mr. Brewer said, at least one electron has entered the tube, causing ionization resulting in an electrical impulse to the counting mechanism.

Radioisotopes, he continued, are the atoms of any particular element that are unstable and constantly disintegrate, giving off electrons at a definite rate.

Industrial applications named include tracing reactions in experiments and checking distribution of alloy components. Only experienced personnel, Mr. Brewer warned, should work with radioisotopes as the constant radiation makes them hazardous.

Forces holding the nucleus of the stable isotopes of an element together are tremendous. For this reason equipment used to disintegrate these isotopes must be large in order that developed velocities be great enough to split the nucleus. As disintegration takes place tremendous amounts of energy are released.

This accounts for the use of uranium in atomic work since the stable isotopes of this element are held together with greater force than those of any other element, therefore the maximum energy is released upon disintegration. The faster this takes place, the more effective is the resulting explosion, the speaker added.

During annual ladies night and dinner dance at Erie chapter, Walter Cebelinski (upper left) is installed as second vice-chairman by Archie Weingard, chairman. In foreground is Mrs. Weingard. Right: R. W. Hall, guest speaker, tells human interest stories on virtue of unselfishness. Mr. and Mrs. Harold Hagle listen at right. Lower: Entire group attending the function.

Boston Again Sponsors Lectures at M.I.T.

Boston, Mass.—For the fourth successive year the Education Committee of Boston chapter has arranged a series of educational lectures at Massachusetts Institute of Technology, Cambridge.

The 1950 series will consist of five lectures to be held in Room 3-270 of the institute, under the direction of Education Chairman Frank H. Leonard, standards laboratory supervisor, Pneumatic Scale Corp., N. Quincy.

The sessions are scheduled as follows:

January 19—"Developing and Tooling a Product for Manufacturing." Speaker: Stanley S. Prackneck, supervisor, methods and time study, E. Springfield Works, Westinghouse Electric Corp.

January 26—"Cylindrical Grinding, Centerless Grinding, Centerless Thread Grinding." Speaker: M. S. Gjesdahl, consultant, Landis Machine Co., professor of machine design at Pennsylvania State College.

February 2—"Special Grinding Applications." Sponsored by Norton Co., Worcester.

February 16—"Gears—Design and Manufacture." Speaker: D. W. Dudley, gear engineering division, River Works, General Electric Co., West Lynn.

February 23—"Surface Roughness, Measurement and Control." Speaker: Donald E. Williamson, chief engineer, Baird Associates, Inc., Cambridge.

Through this and other activities Mr. Leonard's committee is furnishing educational opportunities, not only to members of the chapter and of other engineering societies, but to engineering students and ambitious young men in industry.

Erie Entertains Ladies At Annual Dinner Dance

Erie, Pa.—Erie chapter held its sixth annual ladies night and dinner dance, October 4, at the General Electric Community Center with approximately 35 couples present. The women guests received carnation corsages.

Archie Weingard, chapter chairman, administered the oath of office to Second Vice-Chairman Walter Cebelinski, elected to succeed J. H. Van Kampen, who has moved to Wisconsin.

Harold Hagle, program chairman, introduced the guest speaker, R. W. Hall, an advertising man. Mr. Hall illustrated his subject, "They Served Well," with human interest stories of how one can forget self in doing for others.

Dancing to the Haener orchestra and smorgasboard rounded out a pleasant evening.

Golden Gate ASTE, ASM Honor Former President

San Francisco, Calif.—During a recent visit to the West Coast, A. H. d'Arcambal, vice-president—consulting metallurgist of Pratt & Whitney, Div. Niles-Bement-Pond Co., West Hartford, Conn., addressed a special meeting arranged in his honor by the Golden Gate chapters of ASTE and ASM at the Union League Club, November 2.

Mr. d'Arcambal's talk, "Materials for Cutting Tools and Gages," included all types of tool steels, cast non-ferrous alloys, carbide, Norbide and sapphire. He also devoted considerable time to design of tools, hardening treatments and details of surface treatments.

High interest was evident in the lengthy question period that followed his talk.

An authority in the development of metals for tools and gages, Mr. d'Arcambal is a former president of both host societies.

Sales Engineer, Liaison In Production Triangle

Providence, R. I.—"The machine tool designer, the tool engineer and the sales engineer form an equilateral triangle of effort in a common purpose—economical production. The sales engineer is the liaison man conveying the efforts of the machine tool designer to the tool engineer. If we know for what purpose the machine tool designer designed the machine, we then know the purpose to which the tool engineer should apply it."

James Meehan, sales engineer for Brown & Sharpe Mfg. Co., drew this analogy in stressing cooperation among engineering personnel, during an address before Little Rhody chapter November 3.

Approximately 75 members and guests, including a large delegation from Brown & Sharpe, heard Mr. Meehan discuss "Job Analysis and Machine Selection" at a dinner meeting in Oates Tavern, North Providence.

Find Most Suitable Machine

With slides and films Mr. Meehan showed visually how a manufacturer may realize economy and quality whether small quantity or mass production of parts is required, simply by analyzing the job and applying it to the machine best suited for that type of work.

Nearly every shop, he observed, has a number of machines capable of doing the same job, but there is always one better adapted, either in performance or economy.

In the case of universal machines, Mr. Meehan suggested listing primary and secondary functions, then planning the workweek so that these machine functions are used to best advantage.

Even in mass production great savings may be realized on some jobs by adapting standard machines with special attachments that do the work as well or better than special machines, with the advantage that the machine may be reconverted to regular use afterward.

Others who spoke during the meeting were Ray Morris, a past president of the Society, and E. J. Berry, a former director. Mr. Berry reported on the semi-annual meeting at Montreal.

Guests included B. P. Graves, director of design, P. R. Hatch, sales director, H. R. Schott, newly-appointed director of public relations, and Howard Merrill, assistant secretary and a sales director, and approximately 20 other representatives from Brown & Sharpe Mfg. Co.

Unified Screw Threads Cut Industry's Costs

Pittsburgh, Pa.—Seventy-two members and guests of Pittsburgh chapter heard Glenn H. Stimson, gage sales manager, Greenfield Tap & Die Corp., Greenfield, Mass., explain the new unified screw thread standard at a dinner meeting, October 7, in Hotel Sheraton.

Savings both in gage and tool costs and in fewer rejects of threaded production parts were emphasized by the speaker. A spirited question session followed Mr. Stimson's talk.

National Officers Speak At Twin States Meeting

Springfield, Vt.—Irwin F. Holland, general superintendent, Small Tool and Gage Div., Pratt & Whitney, West Hartford, Conn., and Victor H. Ericson, vice-president of Johnson DeVou, Inc., Worcester, Mass., were guest speakers at the first fall meeting of Twin States chapter.

Speaking October 12 before 75 members and guests assembled at the Trade Winds Cafe, Mr. Ericson, recently installed as a national director of ASTE, reviewed the Society's history from its inception in 1932 to its present international membership of more than 17,000 in 79 chapters.

Mr. Holland, immediate past president and Society director, related early trials and tribulations of the organization. From a small office in a church basement the Society has expanded to a modern office building of its own.

Mr. Holland showed slides of Electrolimit and air gages and their uses in the automotive and refrigeration industries.

Commenting upon the position of the machine tool industry in our American economy, Mr. Holland pointed out that liberalization of the present government machine tool depreciation policy would have a beneficial effect upon the industry and on our economy as a whole.

Guests included three members from the Netherlands: A. J. Pekelharing, research engineer, and K. B. Leydekkers, chief estimator, of the Philips Glowlamps Works, Ltd., Eindhoven and Jan Brandse of the J. L. Bienfait Co., Aerdenhout.

Chairman Lee Davis introduced the speakers and presided over the meeting.

Heat Treat Quiz Pays Off in 'Cartwheels'

Wichita, Kans.—Answers to hundreds of questions plaguing tool engineers from the gold strike of 1849 to the steel strike of 1949 were demanded of Wichita members by "Professor I.Q." Thomas J. Donovan, Jr., ASTE director from Philadelphia, in a "Silver Dollar Quiz," conducted October 14 at Wolf's Cafeteria.

Answers, guesses and speculations were liberally rewarded with "cartwheels" and leather cased half-dollars. Based on the preparation for and heat treatment of metals, the program was both instructive and entertaining.

Prior to the quiz Orville Strahm was elected to the office of chapter treasurer for the remainder of the term.

Schmidt Forms Company

Newark, N. J.—Albert J. Schmidt, first vice-chairman of Northern New Jersey chapter, has established the Schmidt Permanent Mold Corp. at 93 Lafayette St., according to a recent announcement.

Mr. Schmidt was formerly superintendent at Parkway Foundry & Machine Corp., Brooklyn, N. Y., and has served as treasurer of his ASTE chapter.

Sparrow Shows Versatility of Automatic Screw Machine

Rochester, N. Y.—Adaptability of the single-spindle automatic screw machine was made apparent to Rochester members when A. R. Sparrow, supervisor of tool engineering at Brown & Sharpe Mfg. Co., addressed their chapter, October 3.

Mr. Sparrow explained numerous attachments for making parts having particular requirements. A supplementary film illustrated parts for which unusual types of tooling have been developed.

In the ensuing general discussion the speaker ably answered questions from the floor.

Chairman William Gordon welcomed First Vice-Chairman Emmett W. Moore, who had been ill for several months. Mr. Gordon introduced 13 new members and welcomed a group of screw machine students from Rochester Institute of Technology, invited to hear Mr. Sparrow's lecture.

Upper, left: Peter F. Rossman of Symington-Gould Corp. advises Rochester tool engineers how to take responsibility as an industrial executive. Center: William Gordon (right), chairman, presents wrist watch to Fred Bittner, retiring from treasurership after long service. Right: Application of screw machine attachments is explained by A. R. Sparrow of Brown & Sharpe. Below: Charles Codd (left) is pleased with his prize awarded at chapter outing for distinction of being oldest golfer.

William Kamola of the Program Committee outlined plans for future meetings.

* * *

Experience and observations gained in visits to more than 300 industrial plants were passed along to the chapter by Peter F. Rossmann, president of Symington-Gould Corp., Rochester. Mr. Rossmann discussed "Tool Engineering in Management" at an early fall meeting held at the Barnard Exempts Club.

Orders, obedience and efficiency are the major rules to follow, advised Mr. Rossmann. A tool engineer promoted to a supervisory position must not take an inflated view of his own importance and must be objective in dealing with others.

There will be many adjustments to make, but the successful executive will adapt himself to his new situation, the speaker added.

Following the meeting dinner was served and the 100 members and guests enjoyed a social hour.

Chairman Gordon presented a gold wrist watch to Fred Bittner, long-time treasurer of the chapter. Mr. Bittner was compelled to retire from office through pressure of personal business.

* * *

A bright sun beamed on 50 members and guests who gathered October 8 at Churchville County Golf Club for the chapter's first annual golf tournament.

After scores had been posted lunch was served in the clubhouse and prizes were awarded as follows: Low gross, Ray Forkey, high gross, Elmer Gmelin, oldest golfer, Charles Codd, low net, James Aldridge, and Paul Bruno, John Krivitza, James McCabe, William Gardner, William Waldek, George Texter and Sidney Hood.

Chairman Gordon was presented with a magic propeller stick which changes direction of rotation when rubbed with a pencil. This and the manner of presentation of awards by Co-Chairmen Gerald Sick and Ernest Schramm kept the entire group in continuous hilarity.

Scientist Bares Problems In Making Plutonium

Lawrence, Kans.—The University of Kansas student section of ASTE had a peek into "Engineering Problems in Atomic Piles" when Dr. J. O. Maloney, chairman of the KU Research Foundation addressed their October 12 meeting in the new Fowler Shops on the campus.

Relating his wartime experiences with the DuPont plutonium manufacturing project, Dr. Maloney pointed out the difficult problems of cooling the pile, obtaining pure chemicals and machining an unknown metal. He explained to the engineering students the difference between radioactive and fissionable materials. At the conclusion of his talk the speaker answered questions from the audience.

During a business session Chairman Ralph Andrea announced plans for members of the student section to escort visitors through the new shop building during the convention of the Society for the Promotion of Engineering Education. Projected field trips and meetings with the Kansas City parent chapter also were discussed.

After the meeting was adjourned, refreshments were served.

* * *

An earlier meeting, opening the fall semester, featured an industrial safety film, "Every Tenth Man."

Officers and committee chairmen were announced as follows: Chairman, Ralph E. Andrea, vice-chairman and program chairman, George C. Hopkins, secretary-treasurer, Alvin A. Knox, parliamentarian and summer work chairman, John W. Hoover, membership, Charles E. Inderwiesen, refreshments, Donald R. Vesper, field trips, Charles Constance, and engineering exposition, Ralph E. Adkins.

Visit
The Tool Engineer's Exposition
Philadelphia, April 10-14

Cutting Tool Plant, Host For Tour and Lectures

Worcester, Mass.—After seeing how drills, arbors, milling cutters and reamers are made at the Union Twist Drill Co. plant in Athol, 107 Worcester chapter members gathered at the Nichewaug Inn at Petersham, October 4, for dinner and a technical meeting. There they were joined by 32 other members and guests.

Robert Moore (left) and Dr. W. R. Frazer of Union Twist Drill Co. were technical speakers at Worcester chapter meeting following ASTE tour of company plant.

Two speakers from the host plant presented the technical session. Robert Moore, technical engineer, lectured on "Specifying and Maintaining Tolerances in Formed Milling Cutters" and Dr. W. R. Frazer, chief metallurgist, discussed "Metallurgical Developments in High Speed Cutting Tools."

Following the speaking program the company's Men's Glee Club entertained.

Guests introduced at the dinner included George Holland, president, Samuel McKay, vice-president, James Horrigan, chief engineer, and John Englestead, works manager of Union Twist Drill; Arthur Starrett, president of Starrett Co., and Victor Ericson, national director of ASTE.

Tells Uses of Abrasives

Windsor, Ont.—More than 120 Windsor chapter and guests turned out October 17 to hear Boyd H. Work, assistant sales manager of the Bonded Products Div. of The Carborundum Co., discuss application of manufactured abrasives. Mr. Work's presentation at a dinner meeting in Prince Edward Hotel was sponsored by the Canadian Carborundum Co., Ltd.

The lecture included various phases in the use of abrasives and a sound film showing the first experiments with manufactured abrasives and some of the more than 75,000 individual industrial applications.

Wilkie Details Gaging

Newark, N. J.—J. B. Wilkie, gage sales engineer, Pratt & Whitney, West Hartford, Conn., discussed the use and care of basic measuring apparatus, as guest speaker at the October 11 meeting of Northern New Jersey chapter.

Mr. Wilkie elaborated on the working and inspection of production gaging equipment, illustrating his lecture with slides concerning new developments in conventional gages. An open discussion followed.

As a meeting attendance prize, the chapter has initiated an award of a "Tool Engineers Handbook."

High Precision Production Seen in Pacific Plant

San Francisco, Calif.—A high degree of precision and quality in mass production was observed by 130 members and guests of Golden Gate chapter in a tour of the Caterpillar Tractor Co. plant at San Leandro, October 18.

One of the most up-to-date manufacturing plants on the Pacific Coast, the San Leandro branch makes fuel injectors and pumps for the firm's diesel engines.

The ASTE visitors viewed production lines of single and multi-spindle automatic screw machines, milling, drilling and boring operations. They saw external, internal, radius, centerless, surface, and crush grinding.

Lapping operations, heat treating, inspection, assembly and testing were studied with interest. The party visited the toolroom and apprentice training department and watched the reclamation of cutting lubricants.

After the tour the guests met in the assembly hall for an informative talk by their host, W. K. Forrester. He explained in detail some of the processes seen during the tour and conducted an interesting question period.

Following the plant visit, there was an informal social gathering and dinner at Plands Villa in San Lorenzo.

Morgan Demonstrates Carbide Achievements

Springfield, Mass.—Springfield chapter was intrigued with the remarkable results obtained by using carbide-tipped drills and chasers in automatic screw machines, as detailed by G. R. Morgan of the General Electric Co., Pittsfield, coffee speaker at a dinner meeting held October 10 at Rovelli's Restaurant.

With samples Mr. Morgan demonstrated what has been accomplished in this field, making his discussion so interesting that the audience was reluctant to have him conclude his talk.

Dr. L. P. Tarasov, metallurgical director of the mechanical section, Norton Co. research department, Worcester, presented the metallurgical aspects of grinding, showing slide illustrations.

A lively discussion period followed each talk. Robert H. Langdon, representing the Norton Co., was technical chairman for the evening. Fifty-two men attended the dinner and 64 were present for the meeting.

New Haven Joins ASM In Heat Treat Quiz

New Haven, Conn.—October meeting of New Haven chapter was held jointly with the local ASM group, with a dinner and technical program on the 6th at Fitzgerald's Restaurant. About 40 members of the two organizations were present.

T. J. Donovan, ASTE national director, presented his "Silver Dollar Quiz," awarding dollars and 50-cent pieces for answers to heat treating questions.

Frank Shute was technical chairman for the evening.

Weighs Characteristics Of Cutting Oil Types

Boston, Mass.—"Soluble Oils Versus Straight Cutting Oils" was debated by W. H. Oldacre, president and general manager of the D. A. Stuart Oil Co., Ltd., Chicago, before 150 members and guests of Boston chapter during their October 13 meeting at New England Mutual Hall.

Water soluble coolants, according to Mr. Oldacre, have the advantages of: (1) quicker and greater cooling, less distortion of work; (2) lower operating temperature; (3) being less objectionable to worker; (4) cleaner work and machines; and (5) lower cost.

But the drawbacks are: (1) hotter cutting tool point; (2) unsuitability for some materials; (3) evaporation of water; (4) difficulty in reclaiming; and (5) poor lubricating quality at high temperatures.

Stresses Chip Formation

Chip formation, said Mr. Oldacre, is the most important consideration in metal cutting. Improper chip formation impairs efficiency of the coolant and wastes power.

At the tool tip, he continued, temperature may reach 1000 deg F with soluble oils. In concentrated cutting areas such as in thread grinding, soluble oils cannot be used. Straight quenching oils, the speaker concluded, are widely used on tool steels, since soluble oils leave this material unhardened.

Before Mr. Oldacre's talk a film, "This Is Louisiana," was presented through the courtesy of the Esso Standard Oil Co.

Arthur Nichols, chairman of the chapter's Thesis Award Committee, presented J. D. Pigott, Massachusetts Institute of Technology graduate, with an award for his paper, "Tool Tip Temperatures."

Arthur Nichols (center), thesis award chairman of Boston chapter, congratulates J. D. Pigott, Massachusetts Institute of Technology graduate, for his prize-winning paper, "Tool Tip Temperatures." Prof. M. C. Shaw of M.I.T. looks on.

Dopp at Chicago Office

Chicago, Ill.—James W. Dopp, a Midwest representative of the Lapointe Machine Tool Co., Hudson, Mass., will have his headquarters at the company's new, enlarged office at 2400 West Madison St., Chicago, J. P. Crosby, vice-president in charge of sales has announced.

Mr. Dopp, who has served in this territory for nearly ten years, is a member of Boston chapter.

Situations Wanted

GRADUATE—B.S. degree in Machine Tool Technology. Seeks position with progressive company. Trained for precision tool work, tool and gage making, and tool design. Foundation laid for work in mechanical inspection, tool planning and tool engineering. Aggressive. Age 24. Married. Box 190, American Society of Tool Engineers, 10700 Puritan Ave., Detroit 21, Mich.

PROCESS PLANNER—7 years' experience in aircraft industry. Earlier experience includes supervisory, design, layout and shop work in machine tool and consumer goods fields. Family health reasons require location in Southern California or comparable climate. Box 191, American Society of Tool Engineers, 10700 Puritan Ave., Detroit 21, Mich.

SALES or WORKS MANAGER—25 years' experience in manufacture, design and sales of gears and tools for producing same. Extensive experience in supervision of manufacturing and sales. Married. Locate anywhere. Box 189, American Society of Tool Engineers, 10700 Puritan Ave., Detroit 21, Mich.

TOOL AND DEVELOPMENT ENGINEER—20 years of practical experience in planning, estimating, machine design, quality control, and production supervision. Excellent references, married, available immediately. Box 188, American Society of Tool Engineers, 10700 Puritan Ave., Detroit 21, Mich.

Klaybar, Lecturer In Die Talk Series

Louisville, Ky.—Louisville members heard L. V. Klaybar, chief metallurgist for Allegheny Ludlum Steel Corp., Brackenridge, Pa., lecture on Die Steels at a dinner meeting, October 12, in the Kentucky Hotel.

A color film showing steel making illustrated Mr. Klaybar's discussion of types of die steels and their applications. In a subsequent open discussion the members asked Mr. Klaybar numerous questions pertaining to their particular problems. The program followed a previous chapter session on Die Design.

About 35 members and guests attended the dinner, with approximately 50 present for the technical session.

Gabriel Promoted

McKeesport, Pa.—T. W. Gabriel, has been appointed general sales manager of the Firth-Sterling Steel & Carbide Corp., the company announces.

Mr. Gabriel has been sales manager of the firm's Ohio district for five years. A Rutgers alumnus, he is an active member of Pittsburgh chapter, ASTE, and of ASM.

Century Sees Gain of 66 Per Cent in Machine Power

Chicago, Ill.—During the past century machine power available has risen from 30 per cent to 96 per cent, animal power has dropped from 50 per cent to 2 per cent, and manpower from 20 per cent to 2 per cent.

These significant figures, quoted by John T. Bobbitt of the Encyclopedia Britannica Films, Inc., make it obvious that the key to increased productivity is through more automatic machining.

Upper left: Faculty members of Allied School of Mechanical Trades are guests at installation of officers of Allied student section of Chicago chapter. From left: Harry Lebeson, Joseph Picraux, Edward King, Louis Schnitzer, Louis Kousens and H. H. Katz. Right: J. T. Bobbitt of Encyclopedia Britannica Films states output per manhour has risen from 27c to $1.40 worth of goods in the past century. Lower: Earl Mechalas, secretary, S. G. Fretch, vice-chairman, and R. E. Lingen, chairman, of recently-formed Allied student section are installed by Roy Hoefer (right) a former chapter chairman.

In the same hundred years, Mr. Bobbitt told 150 members and guests of Chicago chapter, average output per man per hour has jumped from 27c worth of goods to $1.40.

After his resume of the film, "Productivity—Key to Plenty," before the October 11 meeting of the chapter at the Western Society of Engineers, Mr. Bobbitt showed this motion picture depicting the material aspects of our economy.

The film is intended to convey to the general public the progress made in this country not only through utilization of abundant natural resources, but also because we have developed better tools.

A second film, "Distributing America's Goods," presented the problem of distribution in our highly complex economy. Since average cost of transferring finished goods from the manufacturer's door to the ultimate consumer takes 58c of the customer's dollar, only 42c is left for production, the motion picture showed.

Prior to the technical feature Anton Schwister, chairman, introduced Roy Hoefer, a former chairman, who installed the recently elected officers of the Allied School of Mechanical Trades student section.

Taking the oath of office were: R. E. Lingen, chairman; S. G. Fretch, vice-chairman; Earl Mechalas, secretary; and M. P. Unitson, treasurer.

The Allied student section was formed through the efforts of T. C. Barber, first vice-chairman, in developing an active Education Committee. Mr. Barber expects to implement the organizing of other student sections of the chapter.

Guests introduced included Harry Lebeson, president of the Allied school, H. H. Katz, director, Edward King, professor of tool design, Joseph Picraux, professor of mathematics, Louis Schnitzer, professor of die design, and Louis Kousens, professor of technical drawing, also of the school faculty.

Mr. Lebeson expressed the appreciation of the school for the Society's recognition of Allied's two-year technical institute course.

Shows How Industrial Methods Affect Public

Evansville, Ind.—H. F. Williams, public relations director of the Evansville Manufacturers' and Employers' Association, addressed 35 members of Evansville chapter at a meeting October 10 in the Engineering Building of Evansville College. His subject was "The People of Evansville Meet Industry."

The meeting, which began with dinner in the college cafeteria, was highlighted by a motion picture presented by Mr. Williams through the courtesy of the Industrial Engineering College. This film, "Mighty Labors," explained the field of industrial engineering. Functions of methods, time study, wage incentives, job evaluation, process charting and plant layout were shown as they affect our everyday lives, income and purchasing power.

Program chairman for the meeting was Arthur Ullman, chief process engineer at Servel, Inc.

Compares Old and New Screw Thread Standards

St. Louis, Mo.—Otto Hoelzel of the Eastern Machine Screw Corp. addressed 60 members of St. Louis chapter concerning the new unified screw thread standards at a meeting held October 6 in Hotel DeSoto. This subject was discussed in a technical article in the July *Tool Engineer*.

Mr. Hoelzel illustrated his talk with charts of the old and new thread forms, as well as the changes made in tolerances. The speaker demonstrated a thorough knowledge of threads and threading problems during a lively question and answer period.

Gruendike and Gendreau Advanced by Signal Firm

Rochester, N. Y.—Two Rochester Tool Engineers have been promoted by General Railway Signal Co.

Earl T. Gruendike, formerly general superintendent, has been appointed works manager, and Charles J. Gendreau, formerly assistant factory superintendent, succeeds Mr. Gruendike as general superintendent.

On the staff of General Railway Signal Co. since 1922, Mr. Gruendike is Budget Chairman of Rochester chapter, ASTE. Mr. Gendreau joined his company in 1905.

Crush Forming Found Practical to 20 Mu. In.

Flint, Mich.—Crush forming is practical for finishes as fine as 15-20 microinches, according to Carl Soderlund, grinding engineer of the Worcester Sales engineering department of Norton Co.

Mr. Soderlund indicated this in a joint discussion of crush dressing with J. T. Welch, manager of machine tool sales for the Sheffield Corp., before 78 members and guests attending a dinner meeting of Saginaw Valley chapter at Hotel Zehnder, Frankenmuth, October 21.

Mr. Soderlund explained grinding wheel structure, compared crush and diamond dressing and cited results obtained by the crush method. Machines and tooling required for this process were described by Mr. Welch.

Carl Soderlund of Norton Co. and J. T. Welch of The Sheffield Corp. (left and right of Harold DeVore, chairman) were recent speakers on crush forming program at Saginaw Valley chapter.

Chairman Harold DeVore, the presiding officer, announced First Vice-Chairman Benjamin Phillips, Jr., of Lufkin Rule Co., Saginaw, as winner of last year's membership drive.

New members added to the roster include: M. J. Caserio, AC Spark Plug Div., General Motors Corp.; A. R. Bender, Standard Tool Co.; Lloyd Mantle, Vascoloy-Ramet Corp., Walled Lake; Robert Hargesheimer, Lufkin Rule Co., Saginaw; William Wolforth and Henry Appleby, Ballenger Mfg. Co., Inc.; Raymond Greenwood, Strelinger Co.; Lawrence DuBois, George Hatchard, Bernard Hendriksen and Frank Thomas, Fisher Body Div., General Motors Corp., and Brooks Whipple.

G. F. Bennett has transferred from Los Angeles chapter and A. G. Brice, from Detroit chapter.

L. T. Ison of Saginaw was winner of the complimentary dinner ticket award for the next meeting.

* * *

For the kickoff meeting of the season, some 200 members and guests assembled at Bowling Green Country Club in Saginaw for dinner, after an inspection trip through the Frankenmuth Brewery.

Chairman DeVore conducted a business meeting and Clifford Bendle of the National Membership Committee served as toastmaster.

Coming Next Month
Candidates for your 1950-51 Society directors.

Scholarship Winner Pledges Fulfillment

Milwaukee, Wis.—Presentation of the chapter scholarship featured the opening meeting of the Milwaukee chapter season, held recently at the Elks Club.

A. C. Gudert, chapter chairman, made the award to Donald Van Amman of Boys Trade and Technical High School. In a brief talk Mr. Van Amman thanked the chapter and promised to do his utmost to justify the award.

Roy Radtke, education chairman, congratulated the winner and explained the rigid requirements for the scholarship.

E. A. Cyrol, management consultant of the A. T. Kearny Co., Chicago, gave the technical talk, a slide-illustrated discussion of "Tool Design with Control."

Another speaker introduced by Herbert Heimann, program chairman, was H. E. Conrad, executive secretary of the Society. Mr. Conrad outlined Society progress and projects.

Sloan, Half-Century With Cushman Chuck

Hartford, Conn.—Harry E. Sloan, president and treasurer of the Cushman Chuck Co., celebrated his fiftieth anniversary with the company on October 3.

Beginning in the manufacturing department Mr. Sloan has progressed through engineering and executive phases of the business. In years of service he is the oldest executive in chuck manufacturing.

The Hartford chapter member holds patents for pioneering steps in manufacturing processes, product design and development of new equipment to meet modern machine tool needs.

OBITUARY

Stanley T. Goss

Stanley T. Goss, 65, founder and president of the Goss & DeLeeuw Machine Co. of Kensington, Conn., died suddenly October 31 at his home there.

Feeling ill he did not go to his office that day and was fatally stricken in the late afternoon.

Born in Winnetka, Ill., he attended the University of Illinois and went to New Britain, Conn., in 1906 to join the Corbin Motor Vehicle Co. When the firm suspended operations, he became associated with the New Britain Machine Co., leaving there in 1922 to start his own business.

Mr. Goss was a member of Hartford chapter, ASTE, and of ASME, and was active in civic and social organizations.

Kitchen Reads Tool Paper

Flint, Mich.—L. A. Kitchen, assistant tool supervisor, Buick Motor Div., General Motors Corp. and a past chairman of Saginaw Valley chapter of ASTE, recently presented a paper, "Tools, Their Design, Costs and Abuses," to the tool control session of the General Motors Master Mechanics Committee.

Coming Meetings

ALL CHAPTERS—January. Election of Nominating Committee.

CENTRAL PENNSYLVANIA—December 15. Speaker: F. O. Hoagland, Pratt & Whitney, W. Hartford, Conn. Subject: "American Standards in Machine Shop Practice with Emphasis on Surface Roughness." January 19. Speaker: J. L. Schwab, Methods Engineering Council. Subject: "Methods—Time Measurements."

CHICAGO—December 13, 7:00 p.m., Harmony Hall, 4359 W. Thomas. Speakers: W. B. Scott, works manager, and Charles Blahna, engineer in charge of quality control, Motorola Corp. Subject: "Operation of Motorola Production Organization" and "Television in Everyday Language." Followed by tour of Television Div. of Motorola. January 10, 8:00 p.m., Western Society of Engineers, 84 E. Randolph St. Speaker: Harry Procunier, chapter member. Subject: "Alcan Highway and Alaska."

CLEVELAND—January 13. Speaker: G. E. Brumbach, metallurgical engineer, Carpenter Steel Co. Subject: "Tool Steels and the Tool Engineer."

ELMIRA—January 9, 7:00 p.m., Mark Twain Hotel. Joint meeting with ASM. Speaker: Paul G. Nelson, Budd Mfg. Co. Subject: "Deep Drawing of Low Carbon Steel Strip."

ERIE—January 3, 7:00 p.m., Commons Room, Gannon College, Sixth and Peach Sts. Speaker: P. S. Doyen, field engineer, Welding Equipment and Supply Co., Detroit, Mich. Subject: "Tool and Die Welding."

FAIRFIELD COUNTY—January 4, Stratfield Hotel, Bridgeport. Speaker: A. F. Murray, factory manager, Electrolux Corp., Old Greenwich, Conn. Subject: "Designing for Production."

GOLDEN GATE—December 15, Moose Club, Oakland. Annual Christmas Party. January 17, Union League Club, San Francisco. Speaker: O. G. Seeds, sales manager, Cerro de Pasco Copper Corp. Subject to be announced.

PHILADELPHIA—April 10-14, Convention Hall and Commercial Museum. Tool Engineer's Exposition and 18th ASTE Annual Meeting.

SAGINAW VALLEY—December 17. Christmas Party.

TORONTO—January 4. Speaker: R. G. Morgan, Timken Roller Bearing Co., Ltd. Subject: "Design and Application of Tapered Roller Bearings."

TWIN STATES—December 14, 7:00 p.m., Trade Winds Cafe, Springfield, Vt. Speaker: Dr. R. G. Freeman. Subject: "Human and Industrial Relations." January 11, 7:00 p.m., same place. Speaker: C. W. Kennedy, quality control engineer, Federal Products Corp., Providence, R. I. Subject: "Quality Control."

TOOLS OF TODAY

Broaching Machines By Colonial

A line of low-cost Universal Ram-Type Hydraulic Broaching Machines priced below the cost of single-purpose ram-type machines has been announced by Colonial Broach Co., Box 37, Harper Station, Detroit 13, Mich. These "Ram-Press" machines may be used interchangeably for all conventional broaching operations, including surface broaching; internal push-broaching; slotting; and press-work, and are available in 4, 6 and 10 ton capacities. Machines come in 24 and 36-in. strokes.

The machines are high quality broaching machines throughout. Columns are of heavy steel, welded construction, with hardened and ground ways and full length of the column for the ram slide. The hydraulic system provides excess capacity for occasional overloads, and cylinder construction simplifies maintenance and enables replacement of cylinders separately from the ram, should this ever be necessary.

The coolant system has its own separately motorized impeller type pump, and separate start and stop controls are provided for the coolant and hydraulic pumps. Stroke adjustment can be quickly and accurately made by means of externally located collars on trip rod located alongside of the ram. These controls provide automatic stopping of the machine at top and bottom of strokes. A large bracket, bolted to the ram face is designed for use of internal push-broaching and for single or multiple assembly and press-work.

Machines can be furnished with special circuits, for operating receding tables, or with fixtures where demanded by certain surface broaching operations. Special circuits can be furnished for automatic clamping. The inset shows one of the "Ram-Press" machines tooled up for simultaneous surface broaching and slotting of two different parts. In the left hand fixture, several parts are slotted each stroke.

T-12-1

Air-Operated Collet

An air-operated Collet Attachment, designed expressly for increasing the output of both its 10 in. Precision Manufacturing Lathe and its hand-operated screw machine, the Speedi-Matic, by The Monarch Machine Tool Co., Sidney, Ohio, is designed to permit the use of a bar feed attachment.

Pusher type, like the lever-operated collet attachment heretofore supplied for these two lathes, this attachment is designed to reduce operator fatigue on long production runs and to increase productivity. For smaller production requirements, however, costs may dictate the use of the older lever-operated type, which will continue to be available.

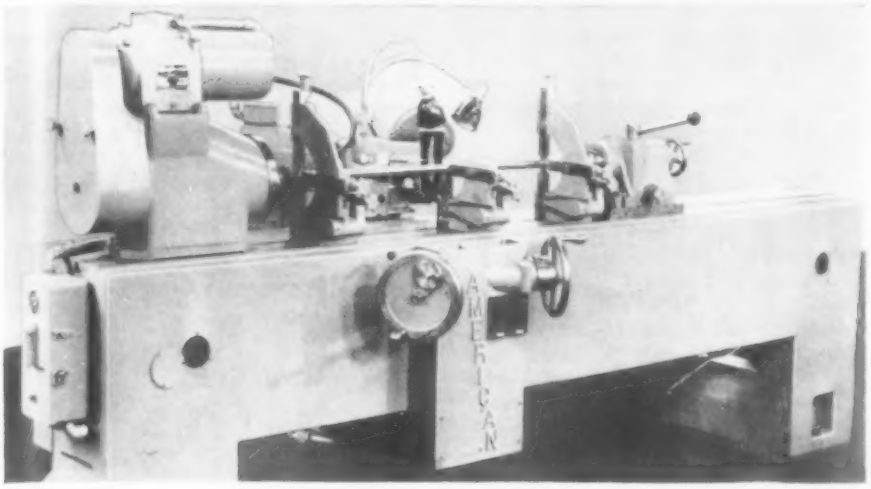
Two pushbuttons, in the headstock of the machine, control the collet attachment. One opens the attachment, and the other closes it, a simple arrangement that accounts in part for the greater production possible with the unit.

Readily applied to the camlock spindle nose of either lathe, the collet adapter takes standard collets and accommodates sizes handling from ⅛ to 1 in. round stock. It should be noted, however, that this attachment is only available for factory application to new Monarch Precision-Manufacturing and Speedi-Matic Lathes. For further information, write the manufacturer.

T-12-2

See page 68 for handy Tools of Today coupon.

Broach Resharpening Machine



A cylindrical Broach Resharpening Machine, by American Broach & Machine Co., Ann Arbor, Mich., mounts the broach between centers on a stationary bed and traverses the grinding wheel from tooth to tooth for faster and more accurate resharpening.

A principal feature is the stationary bed mounting for the broach which eliminates the over-travel on the ways which would be the case should the broach carrier travel. Other features include micrometer dial control wheels for lateral traverse of carriage and infeed of the grinding spindle, and variable speed drive for broach rotation.

The machine can be used to resharpen internal broaches such as involute splines, helical splines, hexagon, cam-shaped, irregular formed, serration and combination type. Two model sizes are available for resharpening of round type broaches up to 9 in. in diameter by 60 and 84 in. long. **T-12-3**

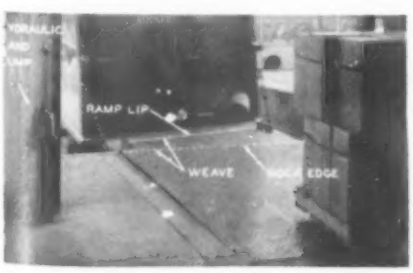
Standard Ejector Pins

Standardized Ejector Pins for plastics and die casting molds, by Detroit Mold Engineering Co., Detroit 12, Mich., are available from stock in seventeen sizes from ⅛ to ¾ in. in diameter. D-M-E-pins are made of Nitralloy with nitrided case which, with a case hardness of 300 Brinell, provides an extremely hard case for long wear with the toughness to resist breakage. **T-12-4**

Truck Loading Ramps

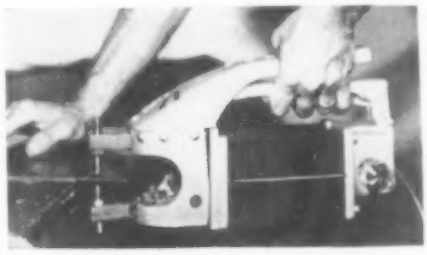
A Trucking Ramp, by Arthur S. Hamilton, Jr., 210 Davis Bldg., Rochester 4, N. Y., incorporates weave compensation which allows the lip of the ramp to follow exactly all of the motions of the truck floor on which the lip is resting. Thus, there is a continuous smooth surface from the floor of the dock to the floor of the truck for sure and safe trucking of even unsteady loads.

The ramp, which is operated by means of a hand hydraulic pump—or by a power pump when ramps are installed in multiple—is built in 5, 8 and 12 ft sizes with 5, 8 and 6 ft 6 in. widths. Description literature on request. **T-12-5**



Portable Spot Welder

Developed for welding economy, the "Big Shot" Spot Welder is a lightweight portable tool designed to be taken to the job. Operating like any big spot welder up to the point of its heat, the 110 volt unit welds two sheets of any weldable steel 20 to 18 gage, galvanized iron, Monel and Hoskins alloys, and stainless steels two gages thicker. The 220 volt unit welds up to ⅛ in. thickness. The latter must be directly attached to comply with safety codes.



Operated with only one hand, and said to be free from shock, the operator has one hand free to hold or position work. The upper tong is fixed, thus permitting locating and resting the electrode directly on the spot to be welded. On squeezing the control, the lower jaw comes up to complete the weld. Complete information available from the Tool & Equipment Distributors, 636 So. 10th Ave., La Grange, Ill.

T-12-6

Automatic Drilling Unit

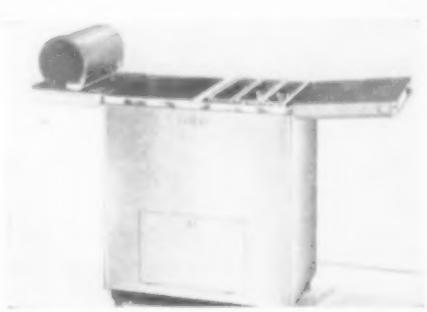
The Govro-Nelson Co., 1933 Antoinette St., Detroit 8, Mich., now offers Model "KH" Automatic Drilling Unit with full hydraulic control. The feeding pressure of the unit is derived from centrifugal force and is accurately controlled by hydraulic means.

By simple external adjustments the amount of rapid approach, the rate of feed and the overall length of stroke may be changed as desired, thus adapting the unit to short-run as well as long-run production of a variety of parts. The external adjustments permit the use of the unit on a full range of drill sizes with minimum set-up time. The unit handles 1/32 to ¼ in. tools with standard collet chuck, depending on materials and drilling conditions. With a special chuck it handles tools up to ⅜ in. in soft materials.

T-12-7

Photo Copy Equipment

Photo copy equipment, recently released for general office use, is said to make available for a complete photo copy outfit with all component parts in one movable cabinet confined to 26x16 inches of floor space and to offer important advantages over the customary assembly of contact printer, dryer, developing and fixing pans ordinarily used.



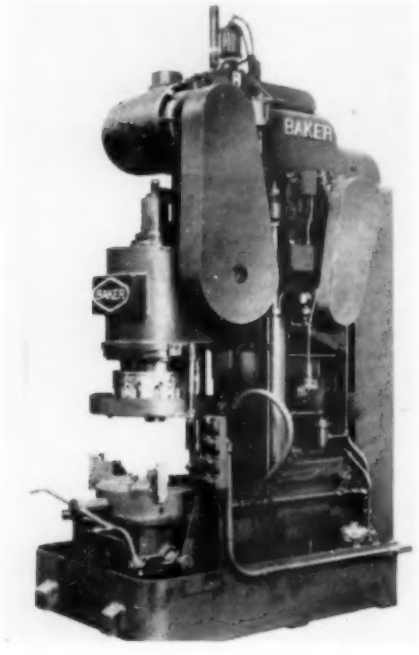
When the top of the cabinet is opened, as illustrated, the contact printer is ready for instant use. Prints are then placed into stainless steel holders and developed and fixed merely by inserting them into the proper slots—without being touched by the hands at any time. An electric dryer compartment completes the process which, in a few seconds, is said to produce perfect, exact copies of letters, drawings, photos, documents, records and forms up to legal size. No special dark room is required as this unit operates in subdued light. Full details can be obtained from the American Photo-copy Equipment Co., 2849 No. Clark St., Chicago 14, Ill.

T-12-8

Production Machine by Baker

A Production Machine by Baker Brothers, Inc., Toledo, Ohio, is designed to greatly reduce operating time in boring, reaming, threading and counterboring in cast iron pipe flanges. Equipped with a 3-jaw scroll and chuck, the machine—designated the Baker 30H04—will handle all size flanges from 3 in. to 16 in. pipe size.

Murchey special full receding pipe taps, with quick-change chasers and reamer blades, perform the boring, reaming, threading and counterboring operations in rapid succession. The machine is equipped with a worm and worm gear drive head and is arranged with sliding gears providing 2 speeds plus pick-off speed change gears. The operating cycle is as follows:



1. Rapid advance of saddle through hydraulic feed pressure to predetermined point where taper reaming operation begins. Cycle controlled through limit switches: 2. Half Nut closes providing positive lead screw feed of saddle for reaming, tapping, and counterboring operation: 3. At completion of operations, half nut opens and saddle is rapidly returned to raised position by hydraulic pressure. **T-12-9**

For Cutting Oil Economy

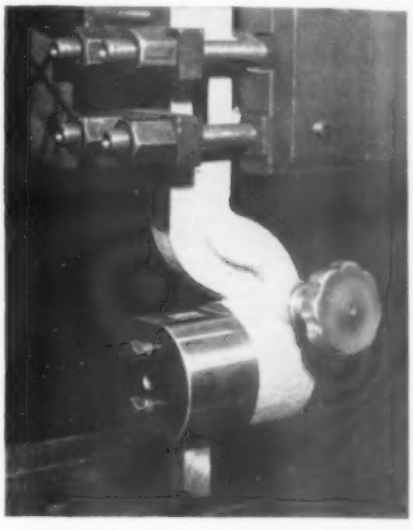
A saving of 50 percent in cutting oils of water soluble type is claimed for "501 Oilsaver", a product of the Beacon Rust Proofing Mfg. Co., 20 E. 33rd St., New York 16, N. Y. A small quantity—1 part to 400 pars of water—is said to allow a 50 percent reduction in oil with no loss in coolant standards.

Anti-rust protection of machines and machined parts is also a feature of this compound, which leaves an invisible protective film on the surfaces it contacts. The manufacturer will send a free test kit if requested on company letterhead; however, requests should be accompanied by a description of machining operation, metal worked, cutting oil used, and a dilution formula.

T-12-10

Heavy-Duty Radius Tool

A heavy-duty Monarch Shaplane Radius Tool is announced by C. B. Teeter, 4470 Oakenwald Ave., Chicago 15, Ill This "big brother" to the smaller Shaplane Radius Tool normally cuts to a 2 in. to 6 in. radius, using a ¾ x 1 in. tool bit. The revolving tool head is over 4 in. in diameter, with shank 1 x 2¼ inches.



With this tool, which is adapted for use on large shapers, planes and lathes, it is possible to cut a perfect half circle 4 to 8 inch radius in a piece of steel up to 2 ft. square and to any length within the stroke of a machine. Weight 37 lb; shipped in a nice wooden case.

T-12-11

Use This Coupon for Complete Information On Tools of Today Items Featured This Month

For your convenience, a key number follows the announcement of each product reviewed in the *Tools of Today* section of THE TOOL ENGINEER. To obtain complete information on any of these products, circle the corresponding key numbers on this coupon, and mail the coupon to THE TOOL ENGINEER.

Tools of Today Department, THE TOOL ENGINEER
10700 Puritan Ave., Detroit 21, Michigan

Gentlemen:

Please send me further information on the following Tools of Today items which I have checked:

T-12-1 T-12-2 T-12-3 T-12-4 T-12-5 T-12-6 T-12-7 T-12-8 T-12-9
T-12-10 T-12-11 T-12-12 T-12-13 T-12-14 T-12-15 T-12-16 T-12-17 T-12-18
T-12-19 T-12-20 T-12-21 T-12-22 T-12-23 T-12-24 T-12-25 T-12-26 T-12-27
T-12-29 T-12-30 T-12-31 T-12-32 T-12-33 T-12-34 T-12-35 T-12-36 T-12-37
T-12-38

Name .....

Position .....

Firm .....

Street..... City, State.....

Air Turbine Hole Grinder

The precision grinding of holes up to 4 in. diameter is said to have been simplified by a compact hole grinding unit recently introduced by the Onsrud Machine Works, Inc., 3927 Palmer St., Chicago 47, Ill. The unit—the Onsrud D1-S Precision Hole Grinder—is designed for use on jig borers, vertical and horizontal milling machines, boring mills, lathes, surface and internal grinders and drill presses. Vernier calibration permits reading of off-center head adjustment to 0.0001 in.

The unit is designed to operate entirely without vibration at a speed of 50,000 rpm on a line pressure of 100 psi, and is designed for use with wheels from ⅛ to ¾ in. diameter. Head adjustment permits grinding holes up to 2¾ in. in diameter, and adaptor plate accessory permits additional adjustment for grinding holes up to 4 in. diameter. Air consumption at 100 psi is 8 cubic feet per minute. For complete information write manufacturer for Bulletin 1126, Onsrud D1-S Hole Grinder. **T-12-12**

Rayon Hose Assembly

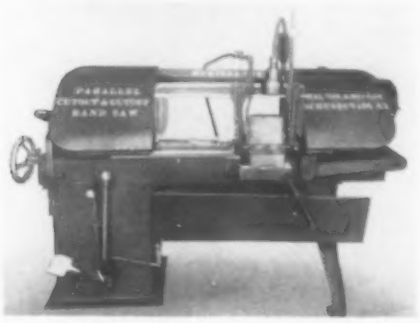
High pressure 2-braid rayon assemblies with pressed-on couplings, announced by J. N. Fauver Co., Inc., 49 W. Hancock, Detroit 1, Mich., are available with any combination of external and internal solid or union couplings, in sizes ¼ ID to 1 in. ID. Identified to the trade as Type "RR-2 Rayon Braid Hose," the hose is constructed of a synthetic core, 2-ply braided rayon cords and neophrene cover and has claimed bursting pressure 2400 to 6000 psi, dependent upon the diameter.

Providing a highly flexible conductor and hose assembly, it can be used for hydraulic circuits or for installations where electricity is involved. The braided rayon hose and neophrene cover, being without any metal braid, tends to eliminate the shorting hazard.

T-12-13

Parallel Cut Saw

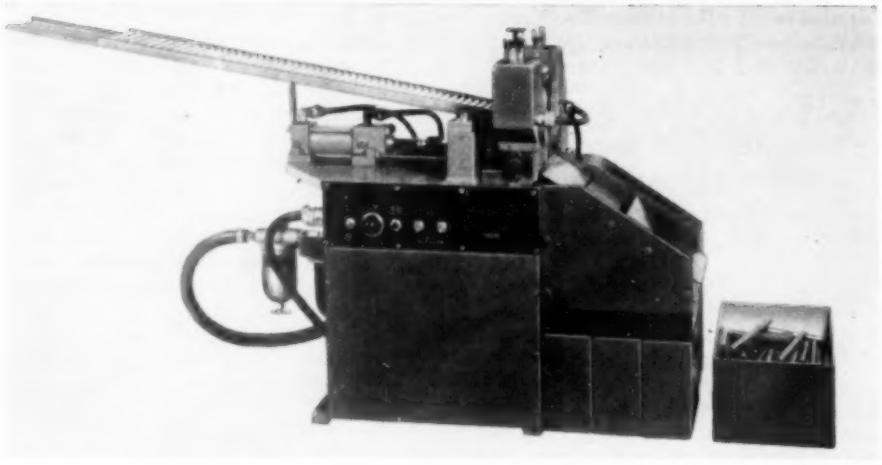
Claimed for the Horizontex No. 8 cut-out and cut-off Band Saw, by Ideal Tool & Die Co., Inc., 731 Congress St., Schenectady 3, N. Y., is that cutting action is always parallel to bed from start to finish.



In addition to conventional cut-off sawing, the machine is designed for production work on right-angle and Vee cut-outs, thus suiting it to shaping operations, with savings in material. Use of coarser saw blades is said to speed cutting up to 30 percent.

A scale on the post is graduated 0 to 8 in. for gaging depth of cut, while a stop, located on the post sets and measures depth of cut. A switch for automatic motor shut-off trips at desired depth of cut. Rectangular capacity of Model 8 is 8 x 16 in.; Model 8A, 8 x 20 in. Descriptive bulletin available on request. **T-12-14**

Custom Engineered Locating and Gaging Equipment



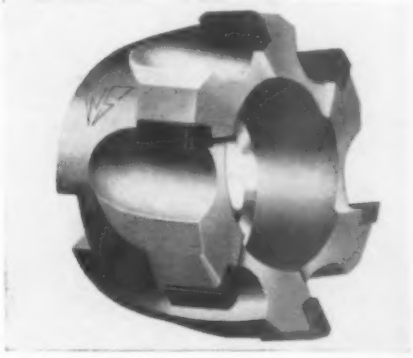
The Brown & Sharpe Mfg. Co., Providence 1, R. I., announces the design and building of specially engineered automatic and semi-automatic Inspecting and Sorting Equipment of simpler, sturdier construction, more stable operation and easier manipulation of sensitivity.

These machines, which can be engineered to meet individual needs for volume of product, may be had for manual loading and disposal, manual loading and automatic disposal, or for automatic loading and disposal. The basic design enables them to segregate a product into any number of categories, each of which can be of any dimensional width.

The machine illustrated gages and sorts straight sleeves, measuring for length and diameter at both ends. The sleeves are measured in four categories: oversize and undersize in lengths regardless of diameter; small in diameter at either or both ends; either or both ends large in diameter; and good sleeves within tolerance. The machine shown has a stated production capacity of approximately 3000 per hour, the capacity being adjustable for different lengths and diameters. It is loaded manually, with disposal automatic. **T-12-15**

Shell End Mill

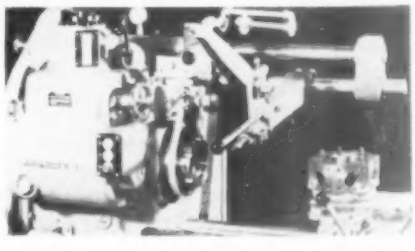
Wendt-Sonis Company, Hannibal, Mo., announces a Shell End Mill especially developed for facing or milling to a shoulder and for operation at higher feeds and speeds. Stated features of design include tooth spacing to permit increased table feeds, flute contour to create correct chip formation with freedom of action and capacity for proper chip removal.



The body is of balanced and heat treated stress-relieved special alloy steel, to provide rigidity and to prevent vibration at high speeds. Carbide inserts of ample capacity overhand the body to prevent the diamond wheel from touching the steel body when sharpening. The cutters are available in sizes ranging from 1½ to 6 in. **T-12-16**

Overhead Threading Attachment

An overhead Threading Attachment said to speed single-point chasing operations in non-ferrous metals is now available for Warner & Swasey Universal Turret Lathes. Mounted at the rear of the turret lathe headstock, the attachment extends a screw-adjustment slide tool holder to the right of the spindle. A fixed overhead bar supports a counterweighted chasing bar on which a guide arm and the chasing tool arm are located.



When the arm is lowered, a follower at the headstock end of the chasing bar engages a leader driven by gears from the spindle. The leader moves the bar and attached tool longitudinally in accordance with the pitch of the leader-follower combination chosen. A slide, which provides for positive guiding of the chasing tool, may be tilted so that a pipe thread can be cut. The threading length which can be cut at one time is 4¼ in. The Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio. **T-12-17**

Glenny "Jumbo" Broach

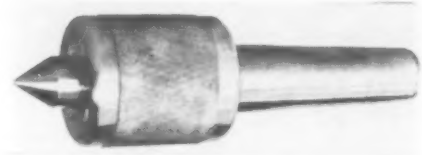
The Kase Machine Company, 18442 Buffalo Ave., Cleveland 19, Ohio, has increased its standard line of Glenny broaches to include a "Jumbo" size series developed to facilitate accurate keyway cutting in large diameter bores. Available in 1-9/16, 1¾, 1⅞, 1-15/16, 2 and 2½ in. diameter sizes, these broaches can be furnished with interchangeable cutting blades of any width up to a maximum of ⅝ in. The broach shown is used to cut ⅝ in. wide keyways in large gears on a production basis.

Usually heavy cuts are said to be possible with these broaches because of reverse-taper blade design; in addition, the end nut is radiused to insure centering of pressure when the broach is pushed through workpiece by means of hand, air or hydraulically-operated press.

Complete units within themselves and designed to facilitate rapid, accurate production operations without need for extensive setup, "Jumbo" broaches can be used to cut keyways in a wide range of large bore diameters when equipped with Glenny eccentric bushing-type adapters.

T-12-18

Ball Bearing Live Centers

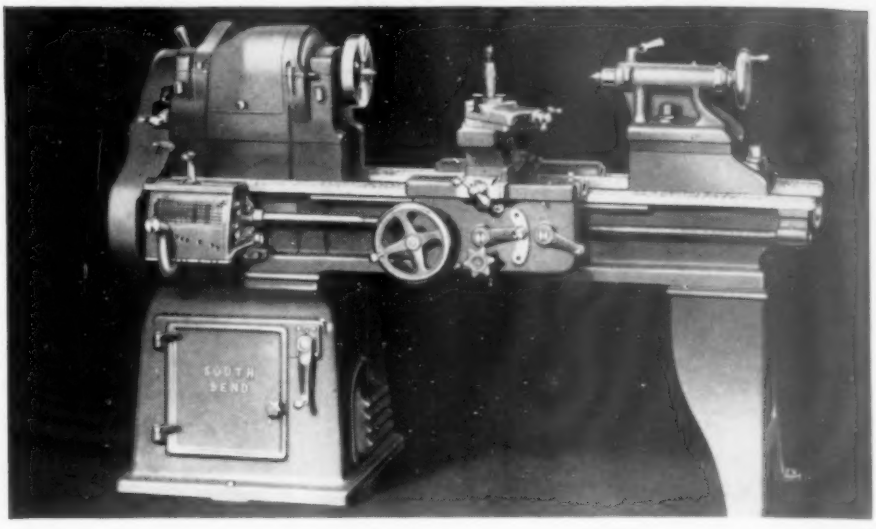


Recent additions to its line of ball bearing Live Centers by Montgomery & Co., 53 Park Pl., New York 7, N. Y., include twelve different standard models and 25 different semi-standard models, the latter adaptable to customer specifications.

The type shown is said to take thrust loads up to 60,000 lb, and a line of Bull Centers take thrust up to 40,000 lb with nose diameters up to 7½ inches.

T-12-19

Large Swing Lathe Has 16 Spindle Speeds



Announced by South Bend Lathe Works is a Lathe especially designed for machining large-diameter work that is not excessively heavy. This 16/24 in. lathe has sixteen spindle speeds from 1 to 727 rpm, a speed range that permits machining all work within the capacity of the machine at efficient cutting speeds.

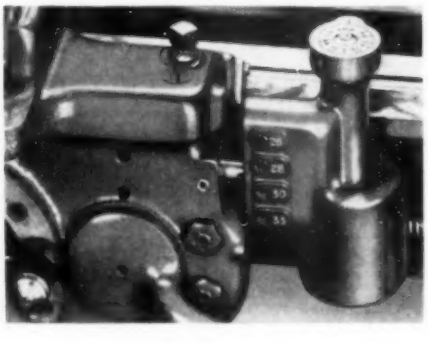
Maximum swing over the carriage is 24¼ in.; over saddle cross-slide 18¾ in. with chip guard and 19¼ in. with chip guard removed. Distance between centers varies from 30 to 102 inches, depending on length of bed. The 6 ft bed lathe is shown. Power longitudinal feeds range from 0.0015 to 0.0841 in., cross-feeds from 0.0066 to 0.0312 in. Full quick-change gear mechanism provides 48 pitches of screw threads ranging from 4 to 224 per inch, right or left hand.

The large capacity and wide range of the lathe makes it particularly applicable as a general-purpose tool for large-diameter jobs such as boring jig plates, turning and boring wheels and similar work. Despite its ample capacity for larger work, however, it is not too heavy or cumbersome for efficient operations for several parts.

The lathe is powered with a 2-speed motor, mounted in the cabinet beneath the headstock. Direct belt drive to the spindle eliminates the possibility of gear vibration at high speeds. Slow-speed drive is through back gears. A 6-station motor control provides quick push button control of speeds, forward and reverse.

This feature, which permits rapid change from low to high speeds and instant reversal, is convenient when roughing and finishing cuts and taken with the same tool. It also saves time on threading and tapping operations. Complete information on this lathe and on accessory attachments, chucks and tools, may be had from the South Bend Lathe Works, 417 E. Madison St., South Bend 22, Ind.

Also by South Bend Lathe Works is a Thread Dial Indicator, shown in smaller photo, especially designed to aid in cutting metric lead screws. Instead of reversing the late to return the cutting tool to start of cut, the half-nuts may be opened and the carriage moved quickly by hand. Currently available for 9 in. swing South Bend Lathes having metric lead screws, the indicator is being developed for other sizes as well. **T-12-20**



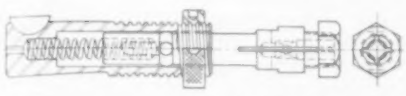
Plastic Optical Lens

A plastic Optical Lens, said to have stable and accurate aspheric optical surfaces corrected for binocular viewing, is announced by Imperial Chemical Industries Limited, 521 Fifth Ave., New York. The substitution of the aspheric surface for one of the spherical surfaces in this magnifying lens is said to allow a much larger field of view free from distortion, so that objects on the edges of the lens can be examined easily and both eyes see the same size of image.

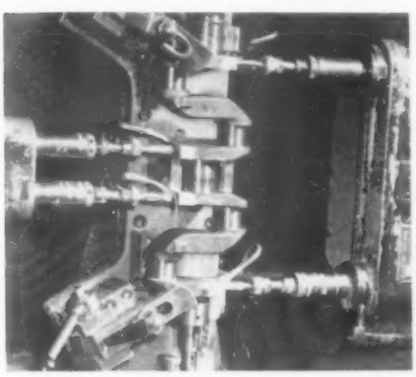
Two sizes of lens are now available. One has a diameter of 5 in. and a magnification of two at a distance of 5 in. from the object to be worked on. The other is 4½ in. diameter with a magnification of three in closer proximity to the object under inspection. The overall field of view given by these lenses under average conditions will be 6 and 5.3 in. respectively, with the image said to be free from distortion over the diameter specified. **T-12-21**

Special Tap Holder Sleeves

Tap Holder Sleeves, especially designed by Scully-Jones and Company, 1901 S. Rockwell St., Chicago 8, Ill., for one of the larger automobile manufacturers, are said to have doubled tap life, reduced holder replacement and time for tap adjustment and charge in addition to practically eliminating run-out.



Collet action is provided by the taper of a standard pipe thread on the outside of the split collet tap holder sleeve. This eliminates slippage during normal operation. An added feature is the extension of one slot—shown in line drawing—to provide access for a drift for knockout of broken taps, should they occur, without dismantelling the complete tap holder. However, tap breakage is reduced by an angular float which compensates for minor misalignment.



The special holders, which may now be standardized due to their performance, are designed for use with Scully-Jones standard Tension and Compression tap holder and are interchangeable with standard tap holder sleeves. A set of the specials, shown in the photo, are applied to tapping plug threads in the oil channels of a crankshaft. **T-12-22 (a & b)**

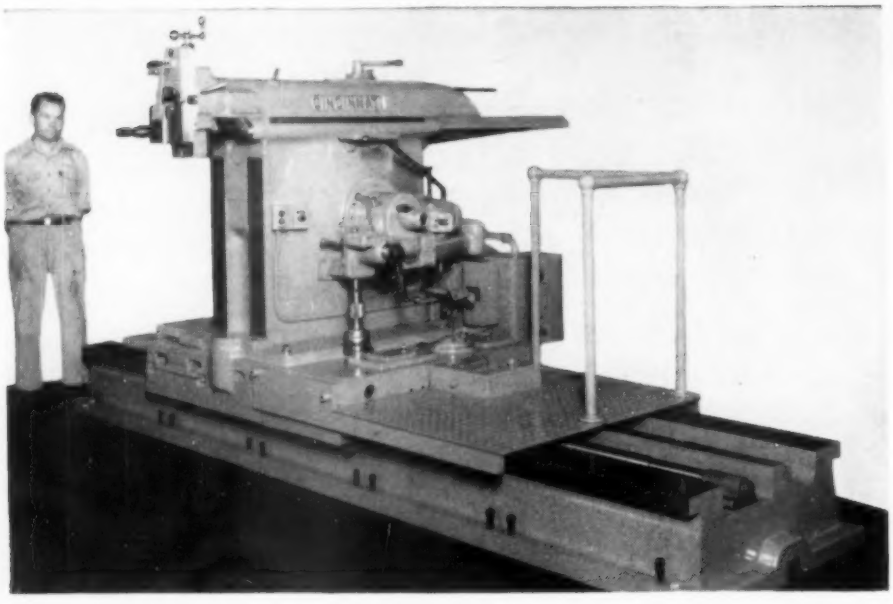
Steel for Plastic Molds

The Carpenter Steel Company, Reading, Pa., announces a steel—known as Samson Extra—for plastic mold cavities and force plugs which, it is claimed, offers an unusual combination of properties to mold makers.

For example, it is claimed that, with this steel, many intricate mold shapes can be hobbed in one operation; that deeper impressions can be pushed with present equipment, and that more accurate reproductions of hob design is possible. Complete information may be had from the maker. **T-12-23**

TURN TO PAGE 68
FOR HANDY
"TOOLS OF TODAY"
COUPON

Cincinnati Introduces Travelling Shaper



While primarily designed to meet the requirements of a Swiss manufacturer of motor generators, a Travelling Shaper by the Cincinnati Shaper Co., Cincinnati, Ohio, can be used for parts requiring shaping over a large area of travel.

Employing the method of travel of a large boring mill, the machine is designed to shape a surface up to 8 ft of table travel without need of resetting the workpiece. Even longer table travel can be obtained by lengthening the ways.

The shaper, which has either hand or power feed and built-in power rapid traverse, is built with 36 in. ram stroke. Ram speeds are available from 8 to 102 strokes per minute, and the tool slide has 9 in. vertical adjustment and power feed. The operator rides on a platform attached to saddle. **T-12-24**

"Push-Button" Inking

"Push Button" application of machinists ink for design layout work is used in a product which, it is claimed, promises greater speed, economy, ease and adaptability than may be obtained with hand application.

Called Kempro Design Layout Ink, the product is packed in a 12 ounce can under pressure and is sprayed on the layout surface by merely pressing a button. The ink is said to dry quickly with excellent adhesion to all metals, glass and wood, and provides an ideal surface for the design layout which is both heat proof and resistant to cutting oils.

In addition to the obvious speed and ease of application advantages, the ink reduces waste since the unused portion is always under cover and not subject to inadvertent drying from exposure to air. It is removed with lacquer solvent, toluol or xylol. Available from the Protective Coatings Corp., Northwest Hwy., Des Plaines, Ill. **T-12-25**

Carbide Tool Grinder

The Standard Electric Tool Co., 2499 River Rd., Cincinnati 4, Ohio, announces a twin-wheel Tool Grinder for carbide, cast alloy and high speed steel tools. Designed for wet or dry grinding and operator comfort, the adjacent mounting of roughing and finishing wheels requires but a step from one to the other. Floor space is conserved since, with wheels at the front, the machine may be installed against the wall.

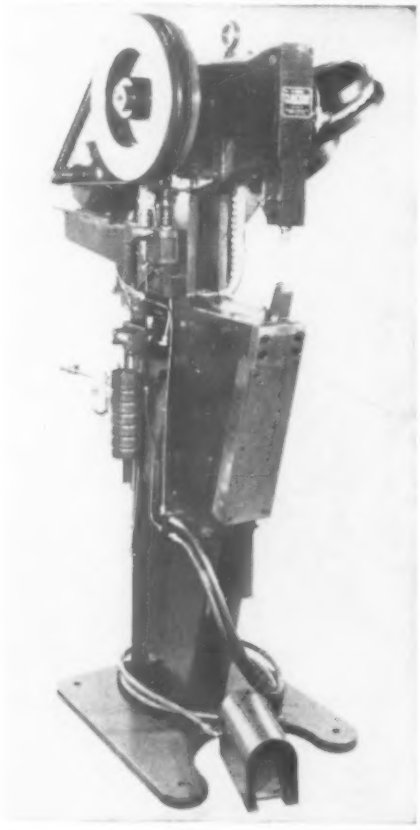
The tilting tables, graduated in degrees, are stationary with table supports integral with the splash pan and base. Table tops have renewable steel wear plates, and convenient handles provide for tilting 15 deg above and 30 deg below horizontal.

Drive is fully enclosed and accessible by removing the front cover, which also exposes the pump, coolant reservoir, settling chamber and drain. Equipment includes reversing control switch; protractor tool guide with diamond holder, and built-in exhaust outlets for dry grinding. Available in two sizes: Type 10TD for two 10 in. plate-mounted cup wheels, and type 14TD for two 14 in. wheels. **T-12-26**

Underfeed Clinchors by T-J

An Underfeed Clinchor, available in a standard model with vertical anvil and anvil guide, and a special model with inclined anvil and anvil guide, announced by the Tomkins-Johnson Co., Jackson, Mich., are designed to automatically feed and set standard square-neck cased nuts. They can also be furnished for handling floating type cased nuts and various sizes of Fabri-Steel nuts.

The standard machines are said to have advantages in flexibility as they will handle a greater variety of sizes and types of nuts than the specials. The inclined anvil and anvil guide of the latter make it possible to set nuts in certain parts that could not be handled on the standard model because of restricted clearances in the parts.



A hopper, at the top of the machine, feeds the nuts to the anvil by means of an in-built underfeed mechanism. The operator places part in machine, properly locating clinch nut in hole in the part and presses the foot pedal, causing the ram to descend and set the clinch nut firmly in the part. When one nut is set, the underfeed mechanism instantly reloads the anvil ready for the next operation. The machine is fully automatic, extremely rapid in operation, controlled by a single foot pedal, and output is limited chiefly by the speed with which the operator can feed the work to the machine.

Capacity of the standard machine is 9/16 O.D. to ¾ in. O.D. "D" type clinch nuts; 17/32 to 29/32 in. square "Case" type clinch nuts; and extruded type clinch nuts. Range of throat depths, 8 to 36 in. inclusive. **T-12-27**

Demountable Conveyor Top

Hamilton Tool Company, Hanover at 9th St., Hamilton, Ohio, announces a roller conveyor top designed to fit over the Portelvator which is one of the standard products of the company. The latter, a portable elevating table with 4-point support and three table surfaces, is used for lifting and transporting heavy tools and materials.

The conveyor top rests on the top table surface and may be mounted or removed without tools, as required. A wedge placed between rollers at each end of the load, prevents slippage of load during transit.

The top shown is mounted on a standard "Style A" Portelvator. Tops are also available with rollers mounted at the ends, and either style can be furnished with a cam-operated roller locking device. Literature describing these and other units available on request. T-12-29

Besly Adds High-Speed Drills

High-speed Twist Drills and Reamers have been added to the present line of taps, abrasive wheels, grinders and accessories by Charles H. Besly & Company, 118-124 N. Clinton St., Chicago 6, Ill. All styles and sizes of drills and reamers are to be available, with the more popular kinds carried in stock for immediate delivery from Chicago.

Like Besly Taps, the drills and reamers will be sold through a selected group of industrial distributors throughout the country. Complete specifications and prices may be had on request.

T-12-30

High Speed Press Brake

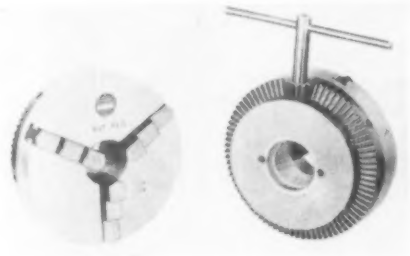
Features claimed for a high-speed Press Brake, by The Cyril Bath Co., 7043 Machinery Ave., Cleveland 3, Ohio, are speeds up to 80 strokes per minute and wide bed and ram areas for the mounting of punching and blanking dies. It is equipped with a press-control safety mechanism which may be used in continuous operation or to stop automatically at the top of the stroke. Overload protection is also provided, and accidental excessive loads automatically throw out the clutch to prevent damage to press or dies.

These high speed presses, of which the one shown is of 35 ton capacity, are designed as production tools, combining the adaptability of the press brake with the long slides and air clutches typical of the conventional press. T-12-31

See page 68 for handy Tools of Today coupon.

Unique Universal Chuck

A versatile 3-jaw Universal Chuck that combines the speed of lever operation with the powerful grip of pinion operation is announced by Westcott Chuck Co., Oneida, N. Y. With this chuck, which the makers proclaim as one of the finest engineering developments in Westcott history, machinists can lock their work into place many times faster than with conventional universal chucks.



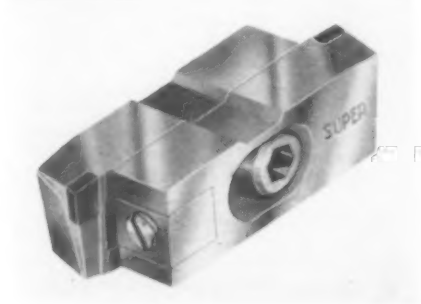
Fast closing is achieved by inserting the wrench stem in any of six easily accessible holes in the outside of the scroll and then rotating the scroll rapidly after the manner of lever action. For final grip, the user slips the wrench stem into any of six additional holes adjacent to the scroll, when the specially designed pinion on the wrench engages with the bevel gear teeth at the back of the scroll.

Named the Westcott "75", the chuck has solid reversible jaws instead of two separate sets. It is threaded for direct attachment to 1½ in, -8 thread lathe spindles and can further be used on milling machine dividing heads. To further increase its uses, the chuck can be mounted on a threaded mounting plate, slotted for bolting to a drill press or miller table, thus converting it a vise or vertical chuck. **T-12-32**

Roughing Blade Announced

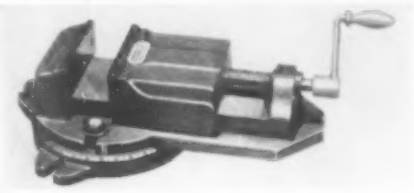
A carbide tipped expansion-type Roughing Blade for boring bars, announced by Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich., has the same range—up to 4 in.—as the expansion finishing blade recently announced by the Company.

The rougher, ruggedly built for heavy cuts with extra support for the carbide tips, is expanded by loosening the set screw. A lock screw in the slide holds it in fixed position. **T-12-33**



"Low-Boy" Machinists' Vise

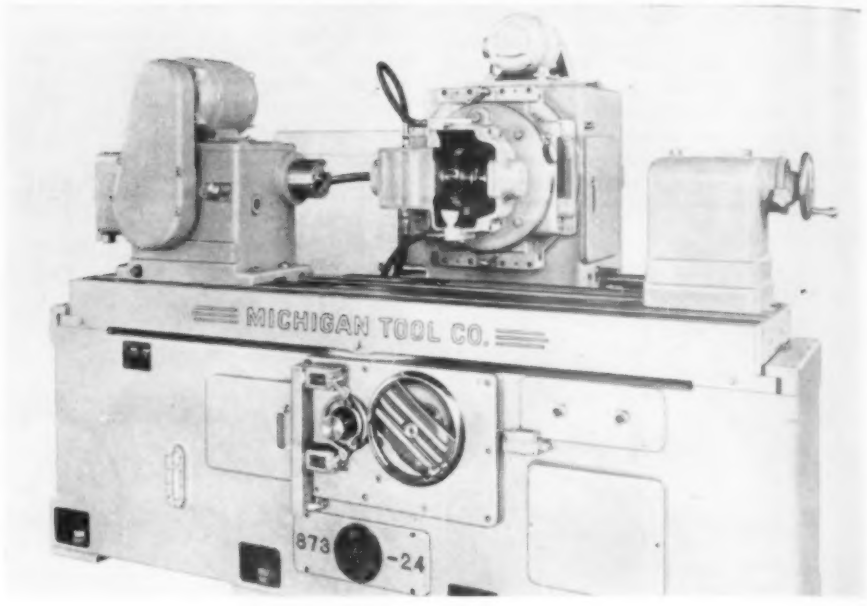
The Parma Manufacturing Co., Parma, Mich., announces the improved Low-Boy Machinists' Vise, now offered in two sizes. The tool is built without T-slots and bolt holes; thus, the inside of the vise is kept free of chips and dirt, a feature claimed to save swiveling and clamping time.



The low, compact design provides extra clearance between table and cutting tool, adds strength and, it is stated, eliminates breakage. The swivel lockplate permits a locking area of 360 deg. clamps the vise more rigidly with less pressure and eliminates time previously required to work T-bolts around in chip-filled slots.

Model P-2 has a height of 5 in. with base (3¾ in. without base), jaw height and jaw width 1 15/16 in. and 5¼ in. respectively, opening with jaws 4¾ in. Weight 65 pounds. Model P-1 has a height of 4 in. with base (2¾ in. without base), jaw height and jaw width 1⅝ and 4½ in. respectively, opening with jaws 3¼ in., weight 35 lb. **T-12-34**

Production Gear Finisher



A high production crossed axis rotary Gear Finisher for heavy duty gears—Model 873—is announced by Michigan Tool Company, 7171 E. McNichols Rd., Detroit 12, Mich. Available in two sizes and completely automatic in operation, the machine is designed to handle spur or helical gears and involute splines from zero to 18 or 24 in. diameter and up to 15 in. face width. Once set up, only loading the gear between centers and pushing a start button is required to complete the entire operation.

In addition to automatic operation for production-line operation, outstanding features of the 873 include ability to shave gears by any of three methods —"underpass", "transverse" or "traverpass", and to curve-shape (crown) both wide face and narrow gears, if desired. Floor space is greatly reduced as compared with lower-output-rate machines designed for large gears, and all controls located at front of the machine. Faster cutting is possible due to inclusion of a "rapid approach" feed in the machine cycle, and automatic in-and-return feed. A special interchangeable cutter head is available to provide for finishing of internal gears.

In the underpass method, used for gears up to 4 in. face width, the cutter slide moves the cutter tangentially to the work to give maximum cutter life and fastest finishing. For this method, which requires only one or two passes, shaving cutters are made slightly wider than the widest gear to be finished.

In transverse shaving, used for wider face gears, the cutter slide reciprocates the cutter across the face of the work, while the head slide feeds the cutter into the work. This feed is composed of a rapid approach plus a slower intermittent infeed—that is, a small amount for each transverse reciprocation—and continues until size is reached. The head then returns to starting position for unloading.

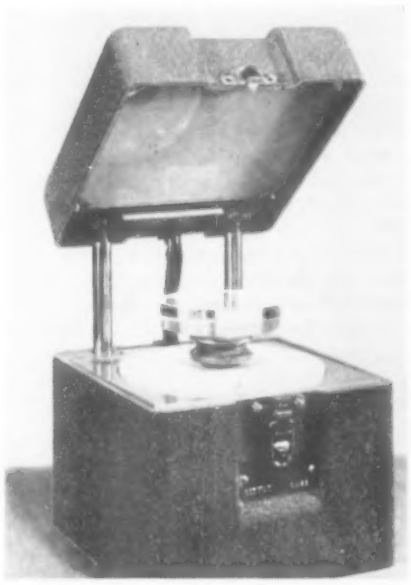
In traverpass shaving, used for gears up to 5 in. face, the cutter slide is set at some angle—less than 90 deg—to work axis, the actual angle depending on the particular gear and cutter. Similar "underpass" shaving except that the feed is part tangential and part across the face of the gear, this method permits the use of cutters somewhat narrower than for "underpass" shaving the same gear; however cutting time is slightly longer.

Gears may be crowned while being finished with any of the three methods. Simplest method with "underpass" and most "traverpass" shaved gears is by the use of reverse-crowned cutters. With the "transverse" method, and for some "traverpass" shaved gears, the work table is pivoted at its center. An auxiliary power-driven adjustable sine-bar mechanism, available as extra equipment, rocks the work table about the center pivot. T-12-35

Light & Optical Flat

Precision-measuring Lapmaster Optical Flats and Monochromatic Lights for checking flatness claimed to have accuracy to less than one light band—0.00000116 in.—are now being marketed by the Crane Packing Co., 1800 Cuyler Ave., Chicago, Ill.

Light source and checking stage are a self contained unit housed in an aluminum case. Easily moved by means of an attached handle, the unit is adjustable from the stage type to a bench type by rotating the head 180 deg.



Optical flats are of natural quartz, and flats of 1/10 light band, accuracy (0.00000116 in.) and 1/5 light band accuracy (0.00000232 in.) are standard. Sizes range to 6 in. diameters. A fully illustrated bulletin describing this equipment and the Lapmaster line of lapping machines is available.

T-12-36

Improved Carbide Grade

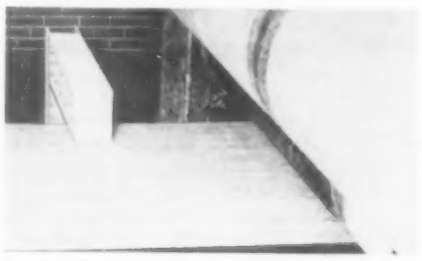
Higher hardness, more wear resistance, greater cutting edge strength and cratering resistance, and a more rapid dissipation of heat at the cutting edge are claimed for an improved No. 905 grade of Carboloy cemented carbide announced by Carboloy Co., Inc., Detroit 32, Mich.

Tools tipped with the material, which is intended to be used for finishing and light roughing cuts on non-ferrous metals and cast irons with hardness up to Brinell 550, are said to show an even longer service life and do a better job of holding size on long cuts and high production jobs than tools tipped with the former 905. Performance has also indicated that heat is carried away faster from the cutting edge.

Many sizes and types of standard tools and blanks in the improved Grade 905, which is also said to be fully as easy to braze and grind as was the old Grade 905, are currently carried in stock. **T-12-37**

Continuous Thickness Gage

The Beta-Ray Thickness Gage, announced by General Electric's Special Products Division, is designed to measure continuously the thickness of sheet materials moving along a conveyor without contacting or disturbing the material.



The instrument measures the amount of Beta-rays which are absorbed by the sheet material being checked. By measuring absorption, the device actually indicates the mass per unit area of the material under test; however, the equipment can also be calibrated in terms of thickness to help operators maintain product uniformity, reduce the amount of rejected material.

The gage is said to find application in monitoring the thickness of metal foils, such as aluminum, copper, tin, brass, and steel, being rolled at high speeds. It can also be used with plastics, textiles, rubber, and other sheet materials, especially those which should not be contacted in processing. **T-12-38**

North East West South IN INDUSTRY

The 1949 Medal for the Advancement of Research, one of the country's top research honors recently was presented to **Fred H. Haggerson**, president of Union Carbide and Carbon Corp., at the annual banquet of the **American Society for Metals.**

Leland T. Weller, carboloy specialist, apparatus department, and **H. L. R. Emmet**, works manager, Erie Works, have retired from the **General Electric Co.** Mr. Weller has been with the company since his graduation from its apprentice training course in 1909, and Mr. Emmet has been associated with G.E. for more than 36 years.

Among recently announced appointments at **Willys-Overland Motors** was **Robert Montgomery** as general parts manager; **C. Coyle Smith**, as assistant to the first vice-president, succeeding Mr. Montgomery; and **Edgard C. DeSmet** to the newly-created post of director of body engineering. Mr. Smith formerly was manager of the projects planning and research department, while Mr. DeSmet adds his new duties to his present responsibilities as head of the styling department.

Milo Franklin McCammon has been appointed general manager of the Stamford division of **The Yale & Towne Mfg. Co.** Prior to accepting his new post, Mr. McCammon was general manager of Ingersoll Steel Div., Borg-Warner Corp.

G. K. Eggleston and **S. E. Gregory** recently were named vice-president in charge of manufacturing and general sales manager, respectively, of **Non-**

Above are the newly-elected officers of the National Tool & Die Manufacturers Association. Left to right (seated): first vice president, Herbert F. Jahn, president, B. Jahn Manufacturing Co., New Britain, Conn.; president, Centre W. Holmberg; second vice president, R. H. Cope, manager, Bunell Machine & Tool Co., Cleveland. Standing: secretary, Alfred Reinke, president, Gus Reinke Machinery & Tool Co., Hillside, N. J.; and treasurer, Herbert Harig, vice president and treasurer, Harig Manufacturing Corp., Chicago.

Centre W. Holmberg, president of Aug. W. Holmberg & Co., Inc., New York, was elected president of the National Tool & Die Manufacturers Association at their recent annual meeting in New York City.

Mr. Holmberg, in discussing the future of the industry, cited the pressure of competition for new models in the appliance industry, and continued need for reduced production costs, as factors which indicated a rise in tool and die business. Better tooling, he emphasized, offers the most practical way of keeping costs down.

In sessions at the meeting, L. R. Boulware, vice president of employe relations of General Electric, pointed out that all management, large or small, must gain the trust and respect of their employes. He cited educational measures instigated by management as the answer to this need.

At another session, Paul R. Hatch, sales director for Browne & Sharpe, stressed the need for cooperative selling, and outlined progressive promotion and selling methods for tool and die manufacturers.

Ferrous **Perma Mold, Inc.**, newly formed corporation owned jointly by the **Barnes Manufacturing Co.** of Mansfield, O., and the **Non-Ferrous Die Casting Co., Ltd.** of London, England. Mr. Eggleston formerly was vice-president of engineering for Barnes, and Mr. Gregory comes from the London company.

Clayton B. Herrick, until recently editor of "Industry & Welding" magazine, has formed the **C. B. Herrick Co.**, which will specialize in the handling of fabricating and auxiliary welding equipment.

George R. Lundberg has been named director of advertising and sales promotion for **The Osborn Manufacturing Co.**, Cleveland. Mr. Lundberg has been associated with Osborn for the past 17 years.

LeRoy Smith, retiring after 52 years of service with **Worthington Pump and Machinery Corp.**, was honored by top officials of the company at a testimonial luncheon. For the past 10 years Mr. Smith served as chief statistician of the centrifugal pump division.

Completion of details involved in merging the **Dor-O-Matic Co.** in the **Logan Engineering Co.** has been announced. A Dor-O-Matic division has been set up within the Logan organization to handle production and distribution of the line of door checks.

Recent appointment has made **Ray P. Johnson** administrative assistant to G. A. Shallberg executive vice-president of **Borg-Warner Corp.** Mr. Johnson, who joined the company in 1929, and is one of its directors, also will retain his post as vice-president of **Morse Chain Co.**, a **Borg-Warner division.**

George V. Luerssen, chief metallurgist, and **Carl B. Post**, member of the metallurgical staff, of **The Carpenter Steel Co.**, recently were awarded certificates of merit by the National Open Hearth Committee at the American Institute of Mining and Metallurgical Engineers, for their work in developing a new method for melting better steel.

Purchase of the 12th Street Traverse City, Mich., plant of **Parsons Corp.** has been announced by **Cone-Drive Gears, Div. of Michigan Tool Co.**, Detroit. Officials state that alterations will be started soon on the war-time built plant, and manufacturing operations are anticipated early in 1950.

American Drill Bushing Co. has opened its new office headquarters and manufacturing plant at 5107 Pacific Blvd., Los Angeles 11, providing for larger area for equipment and increased production facilities.

The Porter-Cable Machine Co., Syracuse, N. Y., have purchased the manufacturing rights and facilities of the **Sterling Electric Tool Products Co.**, Chicago, for the production of the Sterling portable electric and pneumatic sanders.

Announcement has been made of the new location of **Bay State Abrasive Products Company's** Detroit office and warehouse at 880 Lawndale Ave., Detroit 9.

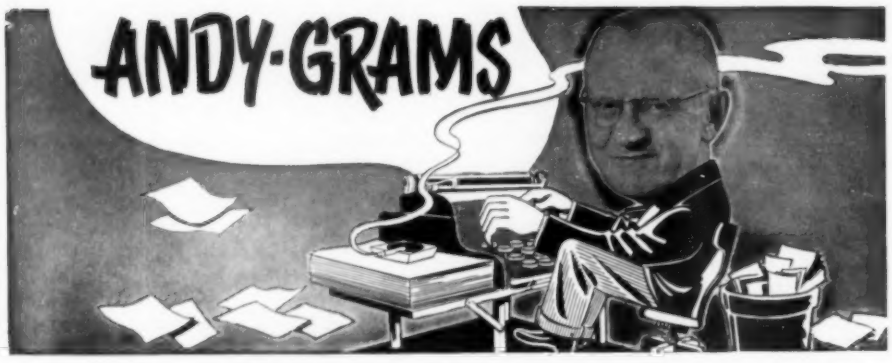
Announcement has been made of the election of **Philip B. Niles** to a vice-presidency of **The Yale & Towne Mfg. Co.** Mr. Niles formerly was public relations director for the Owens Illinois Glass Co.

Dudley W. Moor, Jr., has been elected president of **American Mat Corp.**, Toledo. Mr. Moor, formerly vice-president of the company, succeeds E. M. Belknap who died recently.

William V. Sminkey and **Donald A. Haas**, both former sales engineers of the Braeburn Alloy Steel Corp., have formed the company of **Sminkey & Haas**, 2421 W. Pratt Ave., Chicago, dealing in abrasives, cutting tools and industrial diamonds.

Curtis D. Cummings has been appointed sales manager of **The Allison Co.**, Bridgeport, Conn. Mr. Cummings previously had been associated with SKF Industries.

Arthur H. Starrett, president of **The L. S. Starrett Co.**, has announced completion of the company's plant expansion housing its hacksaw, band saw, band knife and precision ground flat stock division. With this addition, nine acres of floor space are available for production of the Starrett line.



My condolences to all ASTEers who missed out on the Semi-Annual at Montreal, a really fine Convention on which congrats to Fred Schmitt and his fellow workers on the Program Com'tee —and, of course, to Ch'man Mart Cote and his *bon hommes* of Montreal Chapter. While I'm about it, congratulations to everybody including Hizzoner Mayor Houde who, as I inferred from his welcoming speech, has finally bowed to the inevitable and is now a Canadian of French extraction.

For me as for all convenees, the pleasure of meeting old friends and making new ones. A shopping tour with Ed Berry and Mrs. of Li'l Rhody, Ed handing me a cigar which I'm smoking as I write. It's okay! A promenade with Harry Whitehall, just in from his uranium mine up in the Arctic circle. Or is it merely a gold mine? A how-de-do with Joe Petz of Petz & Petz, Poughkeepsie, and a get-together with Len Singer anent machine tools of which more later a/c I've a lot to pack in the one page.

A social up in Al Sargent's room, Al being the perfect host who never lets a guest go away disappointed. Missed Brad Pierce and Herb Tigges, the latter absent a/c illness at home. Here's hoping all's well, Herb. Out for a breather in the sma' hours, met Art Lewis and Dick Lynch out hunting olives, both togged for a blizzard as befitted Coolifornia weather.

Ben Brosheer, being homeless, bunked with me one night, and along in the wee-wee hours I dreamt . . . well, not that I dwelt in marble halls but in a saw mill. Rip snortin'est snoring you ever heard! Funny thing, though, it stopped the moment I woke up. A good address from Howard Campbell of Modern Machine Shop—to a Detroit tobacconist stocking his favorite blend. Guess I'll try it out in the "Gerholt" *engineered* pipe Jimmy Giern gave me a while back.

To show how bread cast on the waters comes back in edible fishes, Bill Pender of Potter & Johnston—for whom I'd looked up an old The Tool Engineer some time ago—invited me out to the Au Lutin for dinner, the party including Mrs. Pender, Rip Collins, Tony Ward and their ladies. (Gosh, how I missed mine!) Me being the stag, I played baby sitter to the little pig which, along with a conveyor system kitchen, is a feature of the Au Lutin. And you should see the frogs!

Anyway, I had a fine time, what with Rip's hillbilly stories and reminiscing with Bill and Tony about old timers at P & J and Langelier's, the latter concern now affiliated with Hartford Special Machine. According to Tony, they're still running across some of my drawings dating back before the 20's.

A skoal with Owen Harvey of Cleveland and a "hoot mon" with Montreal's Scotty McLaren. Greetings fro and to Boston via Jack Savits who looked right chipper after his recent illness; especially, my regards to John Sylvester who, as usual, reminded me of my birthday with a card. Thanks, John!—you're one swell guy, typically ASTE. Ken Stumpf and Hank Rockwell of Hartford, the latter having me momentarily stumped as to identity a/c my infallible(?) memory system for the nonce failing to click.

Women, women, all around, gorgeous, beautiful women! But when I was losing all my Canadian change via a hole in my pocket nary a one of 'em had a needle and thread on their bosoms, so, I had to *cherchez la femme* with the wherewithals to get fixed. The indefatigable Doris Pratt, here there and everywhere getting pics and convention stories. Do you know that in addition to being a good reporter that versatile gal is a milliner, an architect and a carpenter to boot? Oh yes, and a good cook and entirely feminine, as a tip to some of you young bachelors.

At the banquet, a note from Jake Demuth up at the head table which, probably due to the second cocktail Larry Rademacher treated on, I interpreted to solace the ladies. Well, you know me, always willing to accommodate, so I went the rounds doing the best I could considering the competition. Then, on second reading, I got it that Prex Bob Douglas had forgotten to warm the bag pipers with a dram o' Scotch, and them "Ladies from Hell" barelegged at that! Took a Missourian to show a Canadian how to toast the pipers. Now Bob!

For the first time, didn't sit in on the Directors meeting, not wanting to kibitz and all that, but I understand that new Directors Roger Waindle, Les Bellamy and Art Lewis—and, of course, re-elect veteran Vic Ericson—did right well. Prex Douglas quite distinguished himself on all fronts and first thing you know we'll see him in Parliament.

Yessirs, it was a fine Convention and Montreal's a nice town that we'd like to visit again. I thoroughly enjoyed my stay, yet, "east, west, hame's best," and I was glad to get home and have the silent(?) partner scold me for not wearing my red flannels and to find a few more toys to fix for the grandkiddies, not forgetting an effusive welcome from the tailwagger. Be seeing yo'all at the ASTE Show in Philly come next spring, maybe.

Back at the office to find a letter from C. B. Teeter, of Chi, saying that he'd got enquiries on his Shaplane rotary tool even if the pic in the release did get turned upside down. (Maybe we should turn 'em all upside down for added interest.) Also a letter from Prof. Gwiazdowski of Tri-State College to tell about a friend—Joe Starr of Detroit—who'd invented a novel beam compass. Got interested myself and had one brought in for demonstration and it's quite a handy tool as you'll see by looking in the Tools of Today . . . well, if not this month then next.

A letter from Ben John Goodwin of Rochester telling about some antique guns maybe I can get, and here I'm unloading my collection! Yessirs, things just come too soon or too late in my life. But thanks, Ben, maybe I'll take you up after all a/c I almost fell for one up in Montreal. But, I stuck to my resolution besides which the store was closed when I went back to pick it up—uh, I mean for a second look.

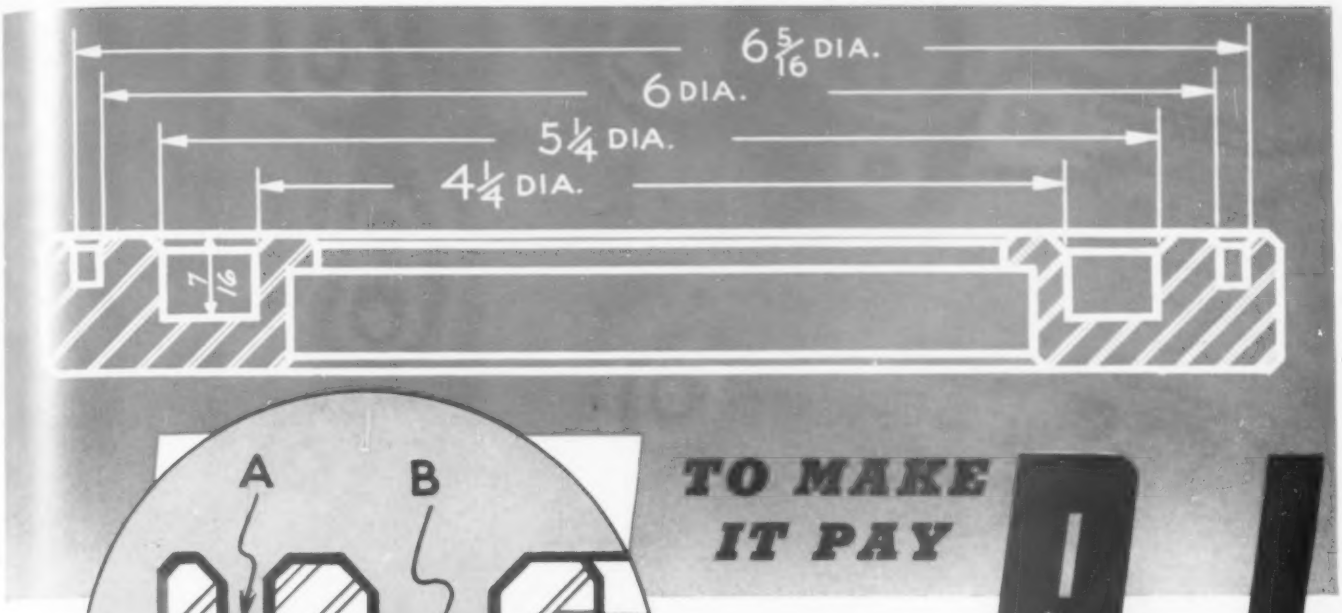
Also a letter from Ed Glenn, of Philly, to say that he'd read my recent comment about Frank McKenna whose body they found in the mountains. Seems they were close personal friends. Art Lewis commented about that, too, him being one of the last to see Frank when he left L.A. for his rendezvous with Destiny. And, a letter from Gene Bouton, Milwaukee, saying he'd decided to call off our ball vs. plain bearing feud.

Well, Gene's one grand guy who, as I recall, organized Racine Chapter and started the ASTE on its way as an international Society. He also served ably as a Nat'l Director and, during the late war, as regional director for the W.P.B. We owe a lot to old timers like Gene and, as far as he is concerned, I hope it won't be a case of "kings forgetting."

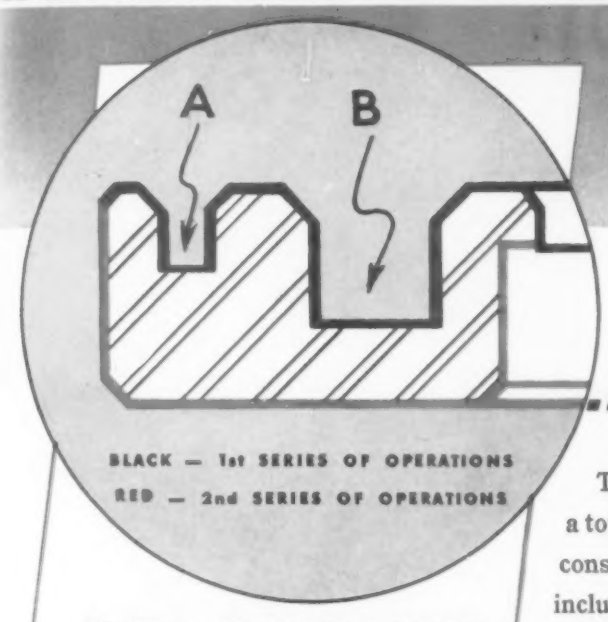
Well, that's about all I can pack in, reserving the space before the final dot to wish all you boys North, East, West, South a Merry Christmas and a Happy New Year. Especially, greetings to those fellow workers on The Tool Engineer staff who won't be with us after the change this month. To Bob Powers, Jimmy Curran and Bob Steiger—the latter now starting his own art studio—my heartiest wishes for future happiness and prosperity. You've been swell guys to work with.

Handily yours

Andy



TO MAKE IT PAY ..CONSULT P&J



BLACK — 1st SERIES OF OPERATIONS
RED — 2nd SERIES OF OPERATIONS

POTTER & JOHNSTON TOOLING SOLVED THIS "TOUGH ONE"

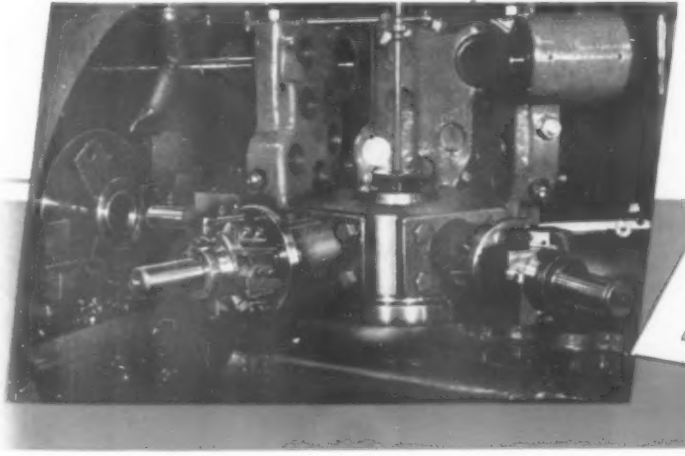
The close-up drawing clearly shows the amount of machining on this forged steel ring — 21 different operations. "A" refers to the trepanning cut from the 6 5/16" dia. to the 6" dia., and "B" points out the second trepanning cut from the 5¼" dia. to the 4¼" dia. Trepanning this amount of steel in one holding indicates how well P&J Tooling teams up with P&J Automatics to combine operations, combine cuts and reduce machining time. Close-up of the P&J-designed trepanning head on the 5D Power-Flex appears below.

The machining on this forged steel Ring job could make it a tough tool-engineering problem: there's considerable, time-consuming work to close tolerances on all faces on both sides, including two trepanning cuts.

Can any of these operations be combined to eliminate unnecessary work handling... can cuts be combined to reduce machine-handling time . . . can machining time be reduced to obtain the greatest possible production?

If the answers are "no", the problem remains a tough one. But the answers are all *"yes"*, because the job is done with P&J Tooling on P&J Automatics — in this case, the 5D Power-Flex.

Practical-minded tool engineers look to P&J Specialized Tool Engineering for the answers to their production problems . . . get their recommendations on *your* tough work.



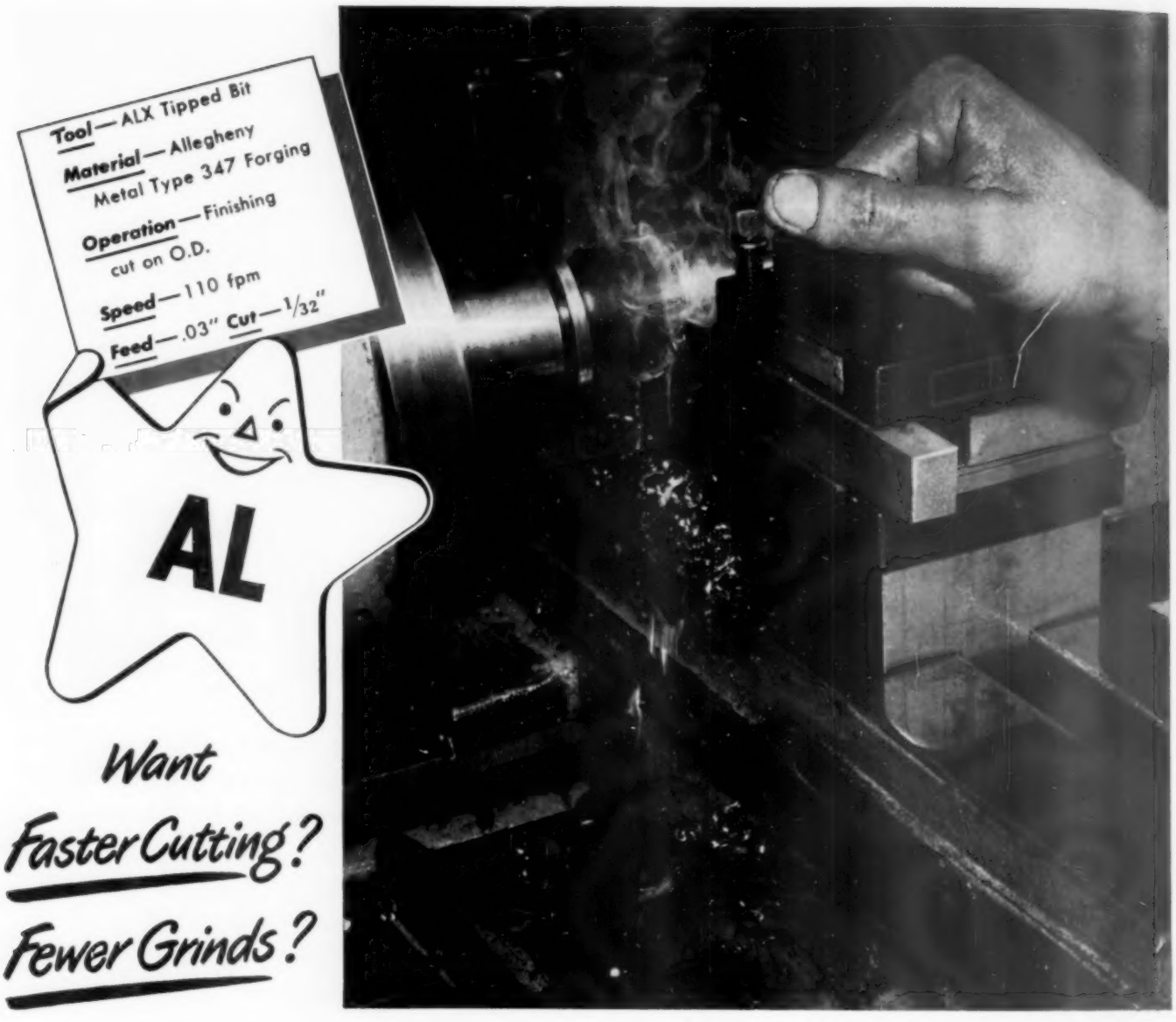
P&J - PRODUCTION TOOLING HEADQUARTERS

Potter & Johnston Company

Pawtucket, R. I.

subsidiary of Pratt & Whitney Division Niles-Bement-Pond Company

P&J



Want Faster Cutting? Fewer Grinds?

...then get ALX CAST CUTTING ALLOY

Write for copy of

"ALX ALLOY TOOL BITS"

An eight-page booklet tells how you can effect production economies by using ALX for fast turning, boring, and facing—in certain applications. Helpful information includes grinding, tool angles, speeds and feeds, brazing of tips. *Write for your copy.*

ADDRESS DEPT. TE-82

Many a machine shop—and probably yours—has jobs on which ALX Tipped Tools or ALX Solid Bits step up production by permitting increased speeds, feeds, and depths of cut. Resharpening is less frequent, the reason being special composition.

ALX is a cast-to-shape, non-ferrous, cobalt-base alloy containing chromium, tungsten, carbon, and boron. The as-cast hardness of 60-62 Rockwell C obviates later heat treatment. Tools stay sharp at accelerated speeds and higher temperatures. Speed range is above that of high-speed steel, but lower than with carbide. At such intermediate speeds, the superior performance of ALX results from toughness, red-hardness, edge-strength, and abrasion-resistance values combined.

An Allegheny Ludlum tool engineer can quickly point out the strategic spots to tool up with ALX. For this service, call A-L.

ALLEGHENY LUDLUM
STEEL CORPORATION
Pittsburgh, Pa.

Forging and Casting Division

DETROIT 20, MICHIGAN

AL

WAD 2715

NEW "QUICK-LOCK" ADJUSTABLE ADAPTER ASSEMBLIES

for multiple spindle machines

by SJ SCULLY-JONES

YOU GET
IMMEDIATE DELIVERY
of these **NEW** "QUICK-LOCK"
ADJUSTABLE ADAPTER
ASSEMBLIES
FROM **STOCK.**

No thread damage. Set screw does not touch threads.

Stronger, low cost Adapter body. No milled slots.

7 COST CUTTING *advantages!*

Your initial cost, set-up time, replacement costs and other economy factors were considered in the design and manufacture of these *New* Scully-Jones "Quick-Lock" Adjustable Adapter Assemblies, that give you seven money-saving benefits.

1. **LOW INITIAL COST.** Savings in manufacturing costs, which we effected by eliminating 4 milled slots in adapter body, are passed along to you.
2. **REDUCE YOUR SET-UP TIME.** Quickly adjusted friction-type nut, locks instantly *any place* on adapter threads.
3. **CUT DOWN YOUR REPLACEMENT PURCHASES.** Last longer; no milled slots to weaken adapter body; no thread damage with *New* "Quick-Lock" Nut.
4. **REDUCE YOUR REJECTS.** National Acme Threads assure accurate fit. Squareness of top face of nut to threads, prevents distortion.
5. **END GUESSWORK ON FINE ADJUSTMENTS.** The "Quick-Lock" Nut is calibrated in steps of .001" for infinitely fine adjustments.
6. **WORK ON CLOSE CENTERS.** Small diameter of nut permits use on Spindles operating on close centers.
7. **MEET ALL YOUR REQUIREMENTS.** Available in wide range of sizes to fit all popular Multiple Spindles.

Scully-Jones AND COMPANY

SEND FOR New Descriptive BULLE[TIN] Containing Prices and Specificatio[ns]

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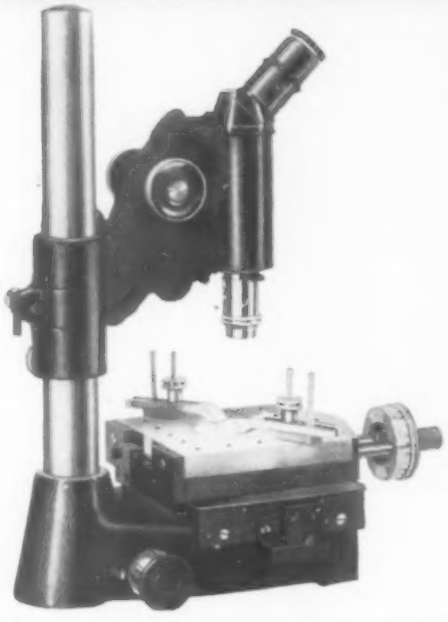
R-8401

YOU GET LOW COST, FAST, ACCURATE PRODUCTION WITH OUR STANDARD AND SPECIAL TOOLS

LOWER COSTS OF PRODUCTION OF INSPECTION

WITH THESE
BAUSCH & LOMB PRECISION INSTRUMENTS



TOOLMAKERS' MICROSCOPE

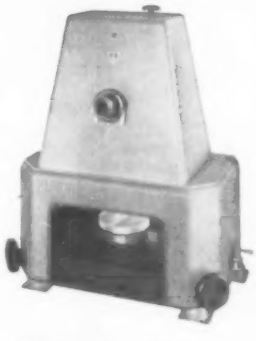
A sturdy shop instrument especially designed for the machinist and toolmaker. It is used for precision linear measurements and, when fitted with the protractor eyepiece, for precision angular measurements. Objects and movements are seen in their natural aspect and direction . . . not reversed as in ordinary microscopes. Both opaque and transparent objects of regular or irregular contour can be measured. It is ideal for measuring parts which would distort under pressure of the most delicate instruments.

Operation is exceptionally simple and fast. Linear measurements to ±.0001" can be made by means of the cross slide stage, controlled by two micrometer screws, and angular measurements to ±1 minute of arc (1'). Various other attachments are available to meet special measurement problems. Catalog D-22.

New PARA-PLANE GAGES

Now you can have "laboratory" accuracy of 0.000001" in the determination of flatness and parallelism of reflecting surfaces . . . with production-line *simplicity* and *speed*. So simple that an unskilled operator can make measurements after a few minutes of instruction.

Two sizes of Para-Plane Gages are available. *Bulletin* D-224.

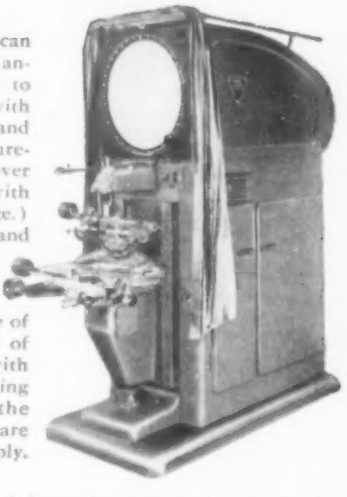


New STEREOSCOPIC WIDE FIELD MICROSCOPES

Provide clear, sharp, three-dimentional, unreversed, magnified images. Used extensively in industry for greater speed and accuracy in small parts assembly operations, inspection of tools and finished parts, and precision curacy in small parts assembly different models for many uses. *Catalog*. D-15.

CONTOUR MEASURING PROJECTOR

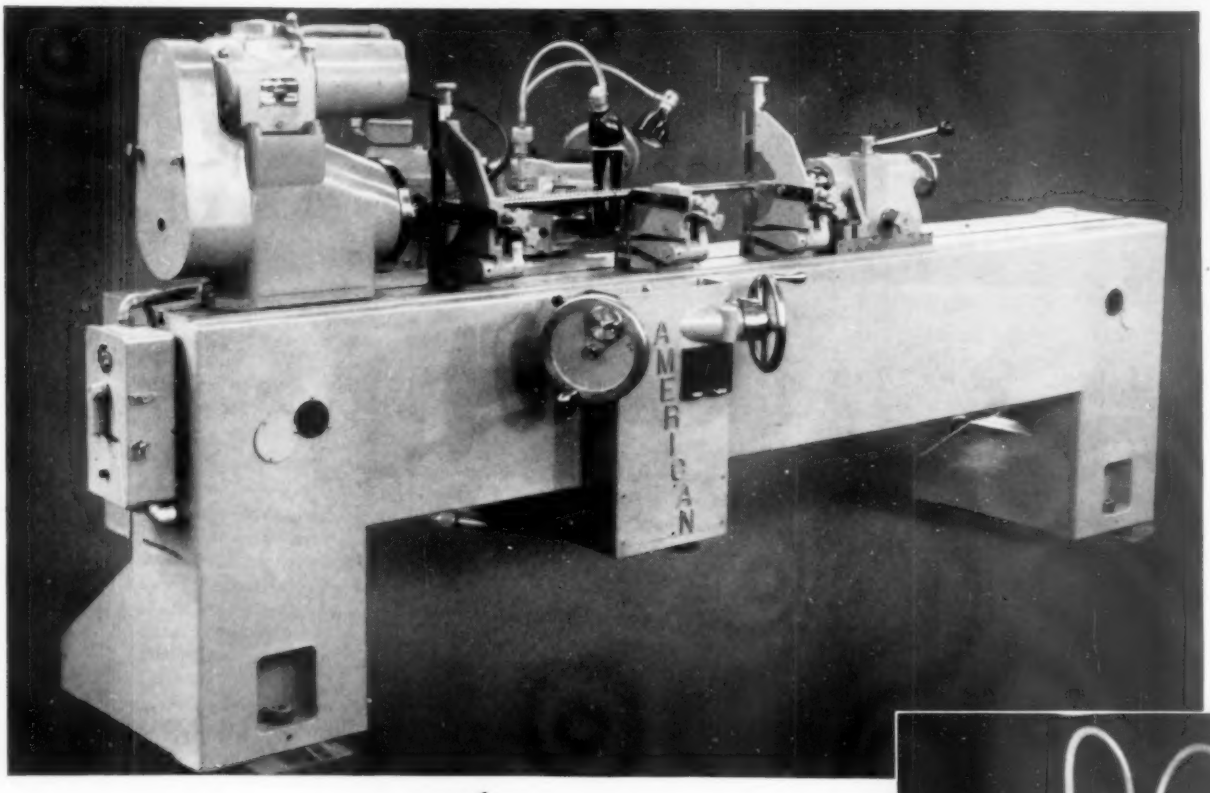
No other projector can match its accuracy (angular measurements to ± 1 minute of arc with a protractor screen, and direct linear measurements to ±.0001" over a range of 4"x6" with the cross slide stage.) Dimensions, angles, and profiles of production-run parts can be compared directly with a *traced outline* of the projected image of the master part, or with a large scale drawing superimposed on the screen. Inaccuracies are found quickly...simply.

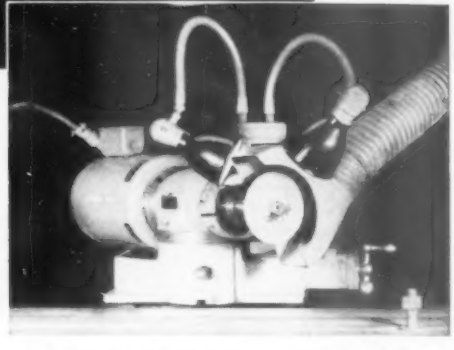


WRITE for complete information on these five important optical aids designed to help you save time and money. You may be paying many times over their cost in lost time and rejects. Send your request to Bausch & Lomb Optical Company, 763-L St. Paul Street, Rochester 2, New York.

BAUSCH & LOMB
OPTICAL COMPANY ROCHESTER 2, N.Y.

• Fixed Broach • Traveling Wheel . . . the *American* way to Better Broach Resharpening





Model RSB 9-84 Inset shows grinding spindle.

The NEW *American* ROUND BROACH SHARPENER

Can Give You These Advantages

- **Time Saved Through Faster Resharpening**
- **Money Saved By Fewer Resharpenings**
- **Part Cost Lowered By Better Resharpening**

The new American Round Broach Sharpener is designed to make possible fast, highly accurate broach resharpening in your own plant. It is speedy, efficient, needs no highly skilled operator.

American designed the new RBS to overcome broach vibration which results in an inferior job. **The broach is rotated between fixed centers, while the carriage mounted grinding spindle is traversed from tooth to tooth.**

Here's what you get with this NEW idea:
1. The broach is supported above and between the pedestals. It never extends beyond the bed. This solid support minimizes vibration, improves resharpening. 2. Machine is more durable because there is less wear on vital ways with the ball-bearing mounted carriage always in full contact — never extended. 3. Resharpening is faster, and more accurate because efficient design relieves operator from mental and physical fatigue. 4. Minimum floor space required because no traveling members extend beyond the bed length.

The RBS has been thoroughly tested, for over a year in actual use, in the plant of one of the largest users of broaching in the country. It has proven highly successful. It saves time in broach sharpening, and gives a better sharpening job.

The American Round Broach Sharpener is now available in two models to sharpen cylindrical broaches up to either 60″ or 84″ in length and up to 9″ in diameter.

FEATURES of the *American* Round Broach Sharpener

- Sturdy Construction
- Heavy Ribbed Cast Iron Bed and Pedestals
- Full Between Pedestal Support
- Simple Manual Control
- All Controls Mounted on Carriage
- Cast Aluminum Carriage Ball Bearing Mounted on Hardened and Ground Rails
- Micrometer Dial and Rapid Traverse Lockout on Left Handwheel
- Right Handwheel Controls Infeed
- Variable speed (100-500 RPM) Transmission
- Graduated Face Plate
- Quick Release Variable Tension Spring Loaded Tailstock

Write for complete informative Circular No. 800. Please address Department T.

AMERICAN *American* BROACH & MACHINE CO.
A DIVISION OF SUNDSTRAND MACHINE TOOL CO.
ANN ARBOR, MICHIGAN

See *American* First — for the Best in Broaching Tools, Broaching Machines, Special Machinery

SUNDSTRAND MACHINE TOOL CO. S ROCKFORD ILLINOIS U.S.A.

What's your RIVETING Problem?

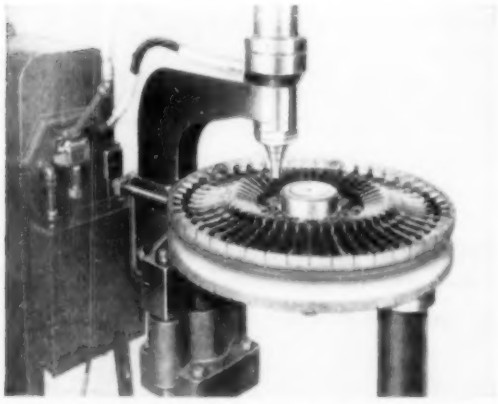
HOT AIR FURNACE SHELLS — At the touch of a button, this 25-ton Hannifin "Hy-Power" Hydraulic Riveter advances... forms rivet...automatically retracts. Time: approximately 2½ seconds!

HANNIFIN *has the answer!*

FAST . . . efficient . . . economical Hannifin "Hy-Power" Hydraulic Riveters pay for themselves in unbelievably short periods of time. More work with less effort, no noise. Push button control! Capacities up to 100 tons. You can't beat the Hannifin "hydraulic squeeze" method of riveting for STRENGTH and HIGH PRODUCTION RATES. For prompt, dependable help in getting tooled-up for efficient production, take advantage of Hannifin's vast store of experience in designing and building hydraulic and pneumatic equipment for all branches of industry. Send for complete information.

STEEL FLOOR GRATINGS—Production line assembly methods are made practical by portable "Hy-Power" riveters designed to reach hard-to-get-at rivets.

HANNIFIN CORPORATION
1119 So. Kilbourn Ave., Chicago 24, Illinois
AIR CYLINDERS • HYDRAULIC CYLINDERS • HYDRAULIC PRESSES
PNEUMATIC PRESSES • HYDRAULIC RIVETERS • AIR CONTROL VALVES



HYDRAULIC TORQUE CONVERTERS—This 17½-ton Hannifin stationary riveter is used in fabricating runner assemblies for hydraulic couplings.

AUTOMOTIVE FRAMES—Hydraulically squeezed cold rivets are unexcelled for strength, dependability, and economy!

HANNIFIN "Hy-Power" RIVETERS

IT PAYS TO SPEND MONEY FOR COST-CUTTING EQUIPMENT!

4 Steps to Increased Tool Life

1. Design each tool carefully to perform its job, considering *fully* all known factors which influence tool life.

2. Select tool steel of the correct chemical analysis with the best combination of properties for each tool or die.

3. Follow heat-treatment recommendations exactly. Use lots of care in hardening and tempering. Avoid excessive decarburization.

4. Establish grinding techniques that produce the ideal surface finish for the intended service, free from grinding cracks.

If you have not been following these four steps religiously, do so and you'll increase tool life.

Bethlehem Steel Company, Publications Department
Bethlehem, Pa.

Please send me a copy of your new booklet describing:

- ☐ *Carbon and Carbon-Vanadium Tool Steels*
- ☐ *Oil and Air-Hardening Tool Steels*
- ☐ *Shock-Resisting Tool Steels*
- ☐ *Hot-Work Tool Steels*
- ☐ *High-Speed Tool Steels*
- ☐ *Tool Steel Selector*

(Check the booklets you wish to receive)

Name _____ Title _____

Company _____

Company Address _____

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It's not a simple formula. Tool design must take many factors into consideration. Grinding procedure, too, is a variable that is seldom easy to perfect.

But follow these four steps, and you're headed for better performance and longer life. And we can help you when it comes to selecting the right tool steel.

Heat-treatment technique is another vital step where one of our technical men can put his finger on the spot that may be causing trouble. All of our tool-steel contact metallurgists are experienced tool hardeners, and they've helped to solve a variety of problems involving tool design and grinding.

Whether it's technical assistance or fine tool steels you need, call on Bethlehem. In our mill depot we carry ample stocks of carbon, oil- and air-hardening grades . . . shock-resisting, hot-work and high-speed steels. Just call the nearest Bethlehem sales office or tool-steel distributor for complete information.

BETHLEHEM STEEL COMPANY
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On the Pacific Coast Bethlehem products are sold by
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BETHLEHEM STEEL

BETHLEHEM TOOL STEELS for EVERY JOB

MORE EXTRA FEATURES OF OILGEAR BROACHING MACHINE

Built as YOU would build them

HERE BROACHING IS ACCURATE AND ACCURACY IS PERMANENT

Welded machine frames are rough, sturdy, **homogeneous** structures. Especially, when the designing, welding and annealing are supervised and performed by Oilgear personnel having twenty years' experience in the manufacture of broaching machine weldments.

The permanent rigidity of Oilgear Broaching Machines in the field testifies to the care the men who build these machines exercise in welding and annealing . . . one more reason why Oilgear Broaching Machines produce so much work at such close tolerances.

HERE YOU SAVE ON OIL COSTS, POWER AND SPACE

For those who can read between the lines . . . Oilgear Broaching Machines use only **ONE FIFTH** the usual amount of fluid power oil. This is possible only because Oilgear Machines have been developed to a high peak of efficiency . . . structurally and operationally.

Heat and power losses are fractional. **You** save up to 80% of oil cost. The very small oil reservoirs save space, help make the whole machine more compact.

1½ TO 2½ FEET LOWER THEY CLEAR LOW CEILINGS

Oilgear Broaching Machines can be located with more freedom . . . they are from 18" to 31" lower in overall height . . . a boon to plants with low ceilings, obstructing cranes and the like.

WHY CUTTING FLUID IS CLEANER—ALWAYS

Slighting details mars perfect performance every time. **Care** for details helps to put Oilgear Broaching Machines in a class by themselves.

Building bigger cutting fluid and chip compartments for example results in cleaner fluid, cleaner work, better chip settling, less frequent chip removal, improved housekeeping. Another detail—you don't have to drain the components when inspecting cutting fluid pumps.

NO EXTRA CHARGES—

YOU GET A COMPLETE MACHINE

When you buy an **Oilgear** Machine, you get a **complete** machine. This is what you get in an Oilgear Broaching Machine, **always**, and at no extra charges:

A fluid power system that gives you, within the specifications of the machine, an **unlimited** range of infinitely, independently variable broaching and return speeds. **NOT** a **fixed** range, **NOT** a **low** range.

Complete manual, semi-automatic and full automatic cycle control. You **don't** pay extra for this.

Dual safety-pushbutton control—at no extra charge.

Shuttle tables—at no extra charge.

Cutting fluid pump, control, wiring, piping, nozzles, splash guard—at no extra charge.

Up to 130% wider tool slides and work tables—at no extra charge.

These are just a few of Oilgear Broaching Machine features. Compare what you get in Oilgear—don't be fooled.

Descriptive bulletins are available on all Oilgear Broaching Machines; write THE OILGEAR COMPANY, 1573 W. Pierce St., Milwaukee 4, Wis.

Oilgear Fluid Power

In leading observatories everywhere, the time-keeping accuracy of delicate chronometers is confirmed by the chronograph record ... equally reliable, the Toolgraph Chart that accompanies every Illinois Tool Works Hob is proof of tool accuracy.

A Certificate of Accuracy from Illinois Tool Works

You can actually *see* the accuracy of your hobs when they come from Illinois Tool Works ... and be *certain* of dependable performance. Costly rechecking of hobs is eliminated by the Toolgraph Chart, an automatic inspection record produced by specially designed electronic checking equipment.

This service is another Illinois Tool Works "first" ... typical of more than 36 years of leadership in the production of standard and special metal cutting tools of all types. For hobs, broaches, gear shaper cutters, milling cutters and special form tools engineered for maximum efficiency in your application, call on Illinois Tool Works.

ILLINOIS TOOL WORKS

"HEADQUARTERS FOR ENGINEERED CUTTING TOOLS"

2501 NORTH KEELER AVENUE • CHICAGO 39, ILLINOIS

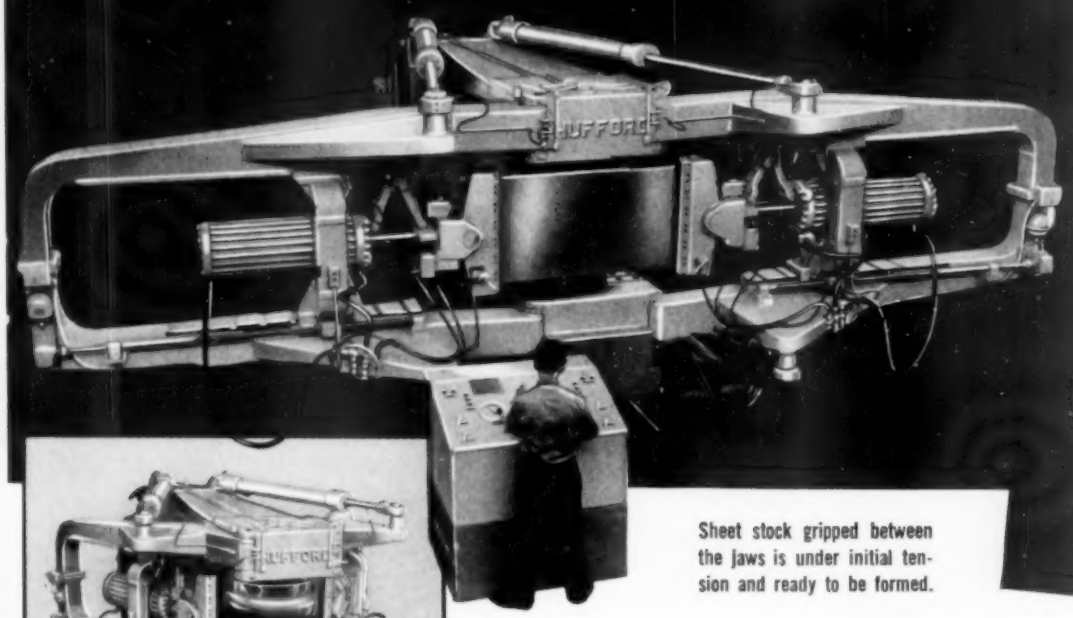
SEND FOR THIS FREE BOOKLET ...

Write today for a free copy of the Toolgraph Chart booklet for the full story of how the Illinois Tool Works Toolgraph Chart can help you increase gear production efficiency.

ILLINOIS TOOL WORKS • ILLINOIS GEARSHAVER INC.

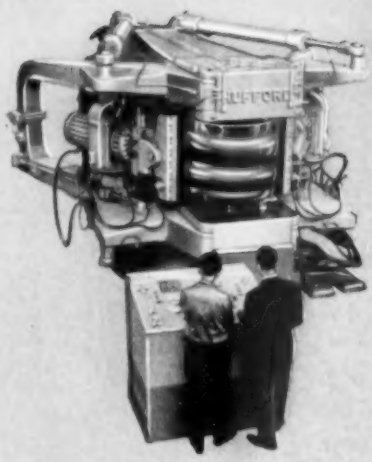
* REG. U. S. PAT. OFF.

HUFFORD HYDRAULIC STRETCH-FORMING MACHINES



Sheet stock gripped between the jaws is under initial tension and ready to be formed.

Another COST-CUTTING APPLICATION of VICKERS HYDRAULICS



Upon completion of forming operation, sheet is stretched to "set" material to die contour.

A vital factor in the economy, high production and accuracy of Hufford Hydraulic Stretch-Forming Machines is the Vickers Hydraulic Equipment used for both power and control. On the Model 50 machine shown here, the power is furnished by Vickers Balanced Vane Type pumps (two-pressure and single); all the hydraulic control valves are also Vickers. The required versatility is provided, and the control of complex movements is easy and accurate. All controls are handled by "finger touch" levers in the control panel.

Vickers Hydraulics improve the operation of many machines . . . particularly those requiring selectivity of control and adjustment to suit type of work. Any sequence of motions can be provided . . . made automatic if desired. Vickers Hydraulic Equipment is inherently self-lubricated . . . easily protected against overload. By means of interlocks, incorrect or unsafe operation can be prevented. Get in touch with the Vickers Application Engineering Office near you for suggestions on how Vickers Hydraulics can improve your machinery.

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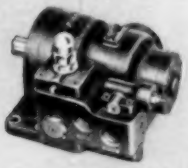
DIVISION OF THE SPERRY CORPORATION

Application Engineering Offices: **ATLANTA • CHICAGO • CINCINNATI • CLEVELAND • DETROIT • HOUSTON • LOS ANGELES (Metropolitan) • MILWAUKEE NEW YORK (Metropolitan) • PHILADELPHIA • PITTSBURGH • ROCHESTER • ROCKFORD • ST. LOUIS • SEATTLE • TULSA • WASHINGTON • WORCESTER**

ENGINEERS AND BUILDERS OF OIL HYDRAULIC EQUIPMENT SINCE 1921

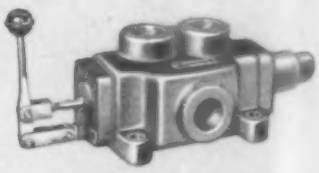
Representative Vickers Hydraulic Pumps and Controls Used on Hufford Stretch-Forming Machines



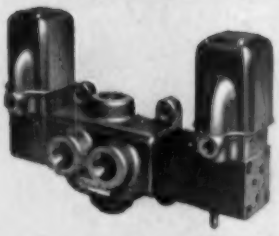
Two-Pressure Vane Pump

Rotary Pilot Valve

Relief Valve



Lever Operated 4-Way Valve



Solenoid Controlled Pilot Operated 4-Way Valve

Right Angle Check Valve

Flow Control Valve

Vane Type Pump (Single)

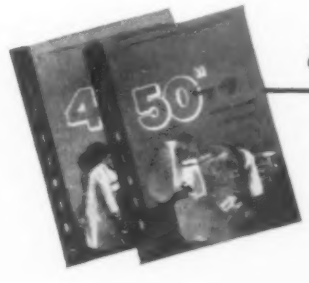
Before you buy your next big lathe use this revealing chart...

SEE WHY LEBLOND 40"-50"
HEAVY DUTY ENGINE LATHES ARE THE BEST BUYS

	LeBLOND 40"-50"	LATHE "X"	LATHE "Y"	LATHE "Z"
27 SPINDLE SPEEDS?	YES			
ENCLOSED QUICK CHANGE BOX?	YES			
HARDENED AND GROUND STEEL BED WAYS?	YES			
ONE-PIECE APRON WITH POSITIVE JAW FEED CLUTCH, AUTOMATIC LUBRICATION?	YES			
POWER RAPID TRAVERSE STANDARD?	YES			
POWER ANGULAR FEED STANDARD?	YES			
ARRANGED FOR 40-50-HP MOTOR DRIVE?	YES			

fill in this chart for yourself

and you'll see why the overwhelming preference in the big lathe field is for LeBlond. From the hardened and ground steel bed ways to the top of the 27-spindle speed headstock... from center to center and in between... the LeBlond 40's and 50's are well designed, heavily constructed, and easy to operate.



for information

on the many other reasons why these lathes are without comparison, see our catalog in Sweet's File for the Mechanical Industries, or send for bulletins HD-170 and HD-180.

LEBLOND

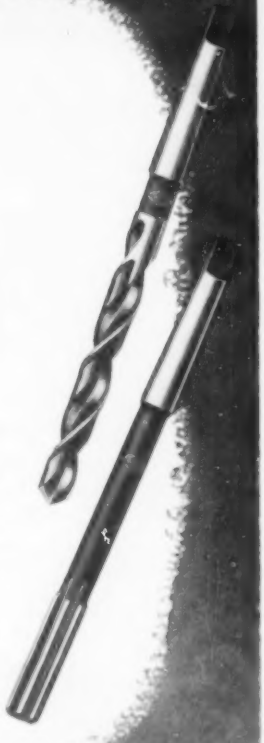
THE R. K. LEBLOND MACHINE TOOL COMPANY, CINCINNATI 8, OHIO
LARGEST MANUFACTURER OF A COMPLETE LINE OF LATHES.
SALES OFFICES: New York, Chicago, Detroit.

Our NEW HOME

OUR new home near Plymouth, Michigan, 25 miles from our old Detroit location, is perhaps the most modern cutting tool plant in the world.

Conditions are ideal for our employees. There is capacity for increased production, and with layout and facilities specially planned and built in for our particular kind of work, our customers can expect even better service than ever before—and certainly a continuation of that quality that has earned us our slogan . . .

"Makers of Fine Tools For More Than a Century"



W&B

WHITMAN & BARNES

PLYMOUTH, MICHIGAN

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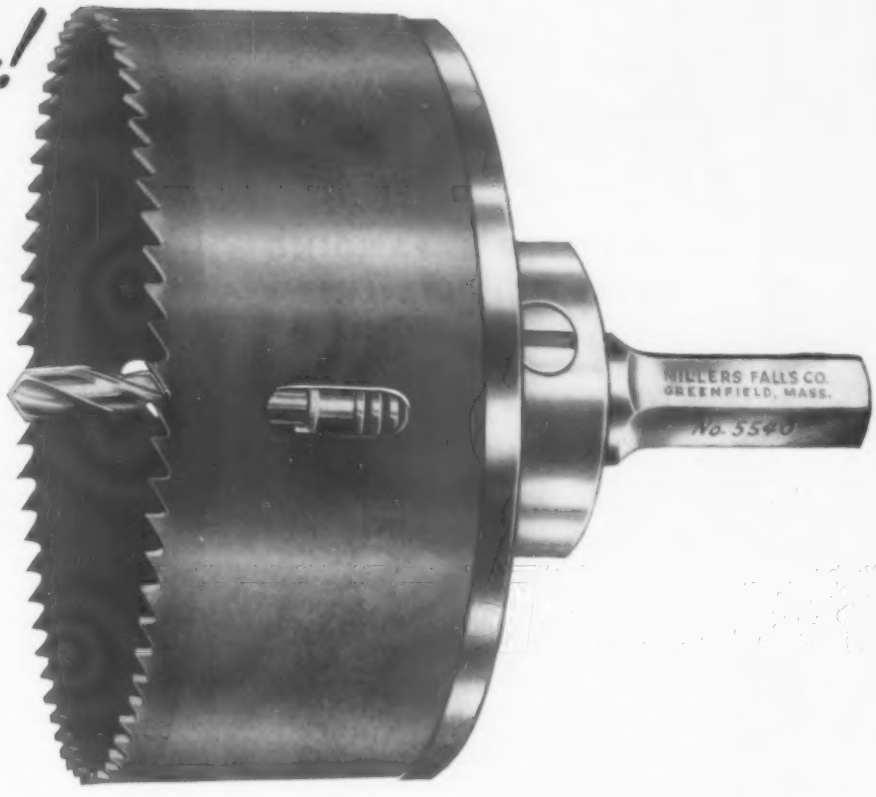
New!

New!

New!



New

Speed big hole cutting in any machinable material with the new, Welded Edge BLU-MOL® Hole Saws

Here's a new time and money saving line of tools that are already proving their value in plant after plant. They're the gang-cutting, follow-through type Blu-Mol Hole Saws.

With specially selected High Speed Edge welded to a super tough alloy back, they easily handle any machinable material from wood to hard steel. They cut holes through solid stock up to $1\frac{1}{8}$" thick. They can also be used on stacked material of lesser thickness or for cutting through successive partitions. And they do it faster, cheaper, more efficiently than possible by conventional methods.

Available in $\frac{1}{8}$" steps from $\frac{5}{8}$" to $4\frac{1}{2}$", the new Blu-Mol Hole Saws can be driven by any portable power tool, radial drill, lathe or drill press with $\frac{1}{2}$" or larger chuck.

Write today for a FREE demonstration of these high performance tools that are already effecting tremendous savings for many companies.

10 OTHER GOOD REASONS TO STANDARDIZE ON MILLERS FALLS

Standard Steel Hand Blades – "Tuf-Flex®" Special Alloy Hand Blades–"Blu-Flex®" High Speed Hand – "Blu-Mol®" High Speed Hand and Power–"Double-Life®" High Speed Double Edge Power – Tungsten High Speed Hand and Power – "Jet-Edge®" High Speed Welded Edge Power – Metal Cutting Band Saws–High Speed Hole Saws – "Blu-Mol®" Tensiometer.

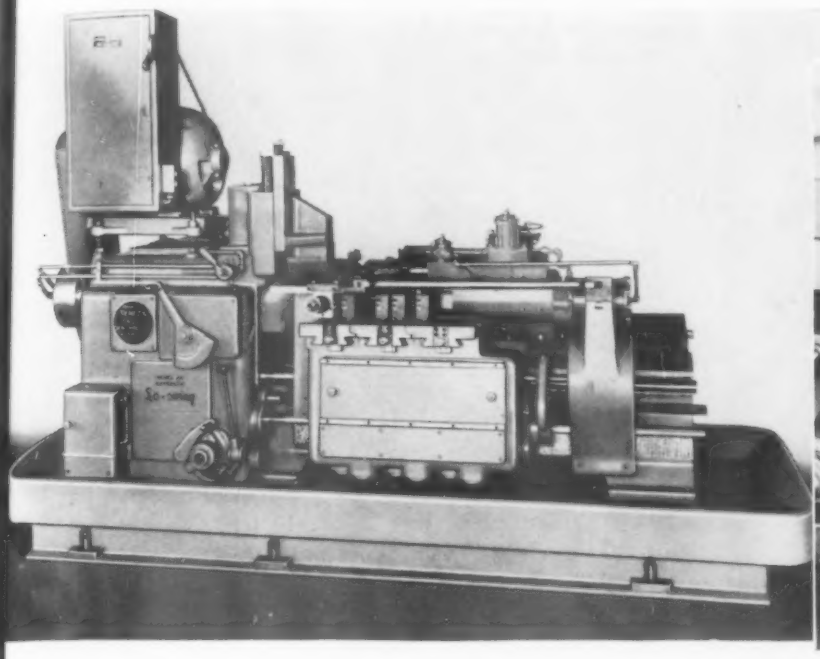
MILLERS FALLS COMPANY

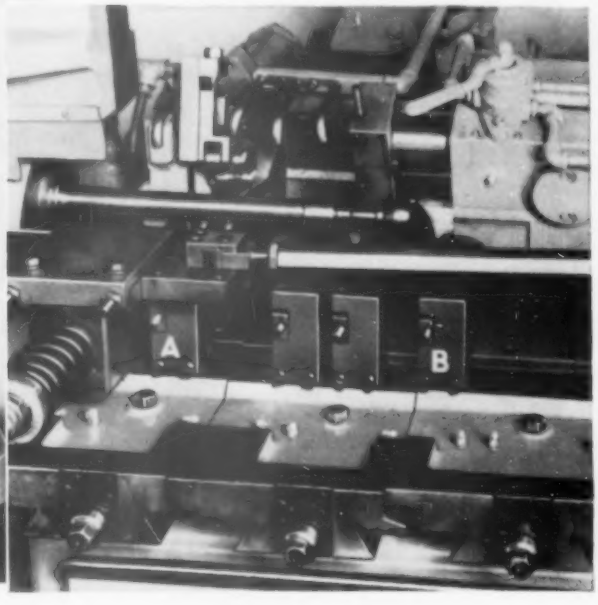
MILLERS FALLS TOOLS SINCE 1868

GREENFIELD, MASSACHUSETTS

MACHINE OF THE MONTH

PARED BY THE SENECA FALLS MACHINE CO. "THE *Lo-swing* PEOPLE" SENECA FALLS, NEW YORK





MODEL "AR" *Lo-swing* SLASHES COSTS ON MAIN DRIVE SHAFT

Problem: To offset high labor costs by increased production on Main Drive Shaft.

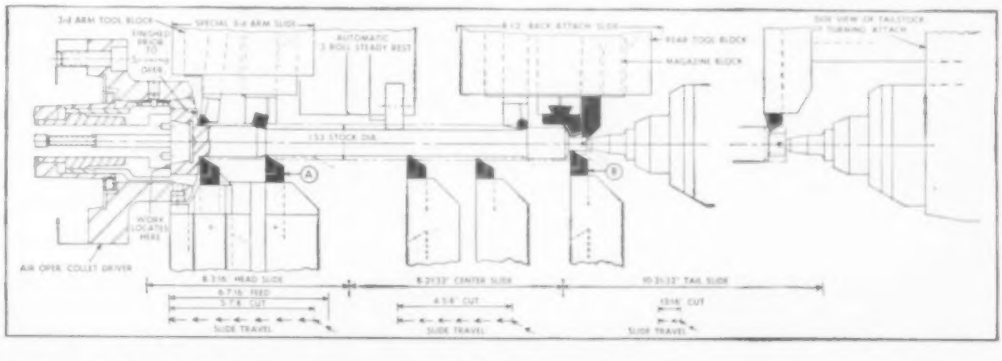
Solution: The Model "AR" Automatic Lo-swing Lathe was selected for this job because it had sufficient weight and rigidity to insure long tool life at high cutting speeds with sintered carbide tools.

Shafts are delivered to the Lathe with the gear end finished to size and the small end centered. The line drawing shows a cross section of the collet chuck which centers and drives the shaft on the gear end. This method of driving increased the rigidity of the shaft. The three-roll steady rest is automatically operated, the rolls being advanced to contact the shaft as soon as tool "A" turns a spotting wide enough to clear the rolls. Tool "A" is the only tool cutting until the steady rest rolls support the piece, after which all the other tools start cutting simultaneously.

Another feature on this machine is the Automatic Tailstock Turning Attachment, shown in the close-up illustration, which is used to rough turn the small end of the shaft ahead of tool "B" which finish turns. This small diameter is held within close limits by this method and a green grind operation is eliminated.

The complete cycle is automatic; the operator simply loads and unloads the parts and pushes the starting button. All tools are carbide. Material is SAE 5140 steel forging and the machine cycle time is 30 seconds.

If you want lower production costs, let us help you with your turning problems.



SENECA FALLS MACHINE CO., SENECA FALLS, N. Y.

PRODUCTION COSTS ARE LOWER WITH *Lo-swing*

Ettco-Emrick ELECTRIC INDEXING FIXTURE

This newly developed electric index fixture offers many important time and cost saving possibilities. With it almost any drill press, tapper or similar machine can be fitted for precision indexing. It provides its own drive through an integrally-built electric motor. Synchronization of the indexing with the vertical movements of the machine's spindle is also accomplished electrically.

A modified geneva system provides fast, smooth, shockless and positive action. Positioning is precise enough to insure extremely close tolerance work.

Write for Bulletin No. 97— It's FREE!

It has full information and prices on these new production-boosting Indexing Fixtures.

ETTCO TOOL CO.

593 Johnson Avenue, Brooklyn 6, N. Y.

Boston, Mass. • Portland, Conn. • Detroit, Mich. • Chicago, Ill.

DRILL & TAP CHUCKS • TAPPING ATTACHMENTS
MULTIPLE DRILLING & TAPPING HEADS
DRILLING & TAPPING MACHINES

For Safe, Fast, Economical Marking . . .

"SAFETY" WEDGE GRIP STEEL HAND STAMPS

Made with two or more characters, trade mark designs, Gothic, Roman, or script style lettering to suit any requirement. Sizes from 1/64" and up. Non-spalling, non-mushrooming features assure long, safe service on all types of marking.

—for concave marking

—for convex marking

—for straight line marking

—for curved line marking

Write for quotation on your requirements.

M.E. CUNNINGHAM CO.
SAFETY STEEL STAMPS

169 East Carson Street · Pittsburgh 19, Pa.

LESS OPERATIONS AND BETTER WORK

WITH A GATCO ROTARY PILOT BUSHING

DUST PROOF

AS A WATCH

ROUND-CHATTERLESS-SMOOTH

GATCO Rotary jig and pilot bushing is built for core drilling, diamond boring, turret tool piloting, piloting hollow mills, line reaming, carbide boring, spot facing, etc.

Originators of Rotary Jig & Pilot Bushings

GATCO ROTARY BUSHING CO.

1300 Mt. Elliott Avenue • Detroit 7, Michigan

DETROIT OFFICE SPACE FOR RENT

Unusually attractive office space available in our new building. Ideal for manufacturer's agent or district office. Air conditioned. Write or phone American Society of Tool Engineers, 10700 Puritan Ave., Detroit 21, Michigan. Phone: UNiversity 4-7300.

broaching will really save you money on those close tolerance high speed internal gears

HERE'S AN ACTUAL CASE:

The Old Production Line-Up	The Way It's Handled Now
1. Rough Broach	1. Rough Broach
2. Shape	2. Finish Broach
3. Shave	
Required Tolerance .0002"	Required Tolerance .0002"

EQUIPMENT USED:

1 Broaching Machine	4 Broaching Machines
18 Gear Shapers	
2 Gear Shaving Machines	

These are actual figures from a well known automotive gear plant which adopted the all-broaching procedure about 2 years ago. Since then savings have been spectacular.

Of course they don't use the garden variety of broaches. The savings and precision achieved would not be possible with ordinary tools.

This plant uses NALOY BROACHES each of which is good for 38,000 gears before it is retired. Naloy broaches have characteristics (and we can prove this) that the average broach shop just doesn't have the facilities to duplicate.

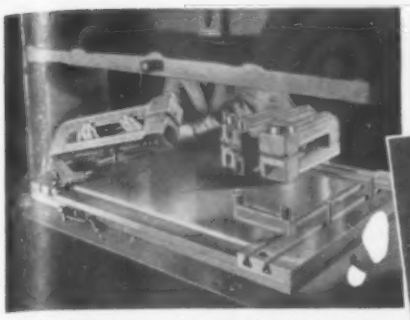
If you want Precision with maximum economy, send for a Red Ring Broach Engineer.

SPUR AND HELICAL GEAR SPECIALISTS
ORIGINATORS OF ROTARY SHAVING AND ELLIPTOID TOOTH FORM

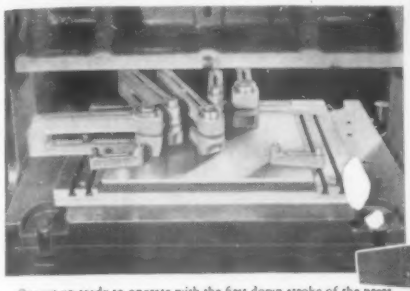
NATIONAL BROACH AND MACHINE CO.

5600 ST. JEAN • • • • • • • • • DETROIT 13, MICHIGAN

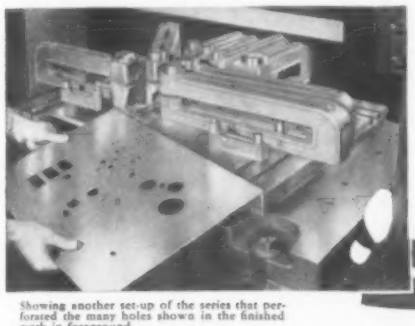
WORLD'S LARGEST PRODUCER OF GEAR SHAVING EQUIPMENT



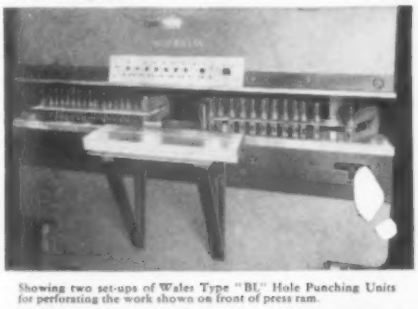
Mounting a Wales Unit on a Set-up Templet which is located on top of the Master Template. Units are bolted down in the T-slots.



One set-up ready to operate with the first down stroke of the press ram. The uniform shut height of Wales Units permits only one ram adjustment regardless of the number of set-ups.

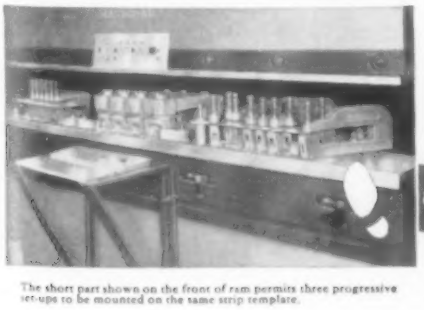


Showing another set-up of the series that perforated the many holes shown in the finished work in foreground.



Showing two set-ups of Wales Type "BL" Hole Punching Units for perforating the work shown on front of press ram.

Showing two more set-ups of Wales Type "BL" Hole Punching Units that pick up another series of holes in the same piece as shown above. Note strip template in bed rail with pilot holes for locating units. The T-slot in bed rail is used to securely bolt units to rail.



The short part shown on the front of ram permits three progressive set-ups to be mounted on the same strip template.

Announcing NEW WALES PERFORATING AND NOTCHING SYSTEM

— in stamping presses

● *Faster, more economical* perforating and notching of sheet metal products is now made possible by this new exclusive Wales Master Template System.

Wales independent, self-contained Hole Punching and Notching Units, equipped with pilot pins, are used in this new system. The Master Template has pilot pin holes over the entire surface in the same pattern as the perforations in the finished work piece. Set-up Templets are placed on top of the Master Template to identify the pilot pin holes required by the Wales Units in each operation. Wales Units permit the use and reuse of the same group of units on unlimited set-ups on the Master Template. *Yes, it is just as simple as that!*

Now, a group of Wales Units can be set up in unlimited patterns and put into operation the same day a pattern is released for production.

There's always something new in the Wales Line. Keep posted by writing TODAY for Bulletin 7 which fully illustrates the new Wales Master Template System.

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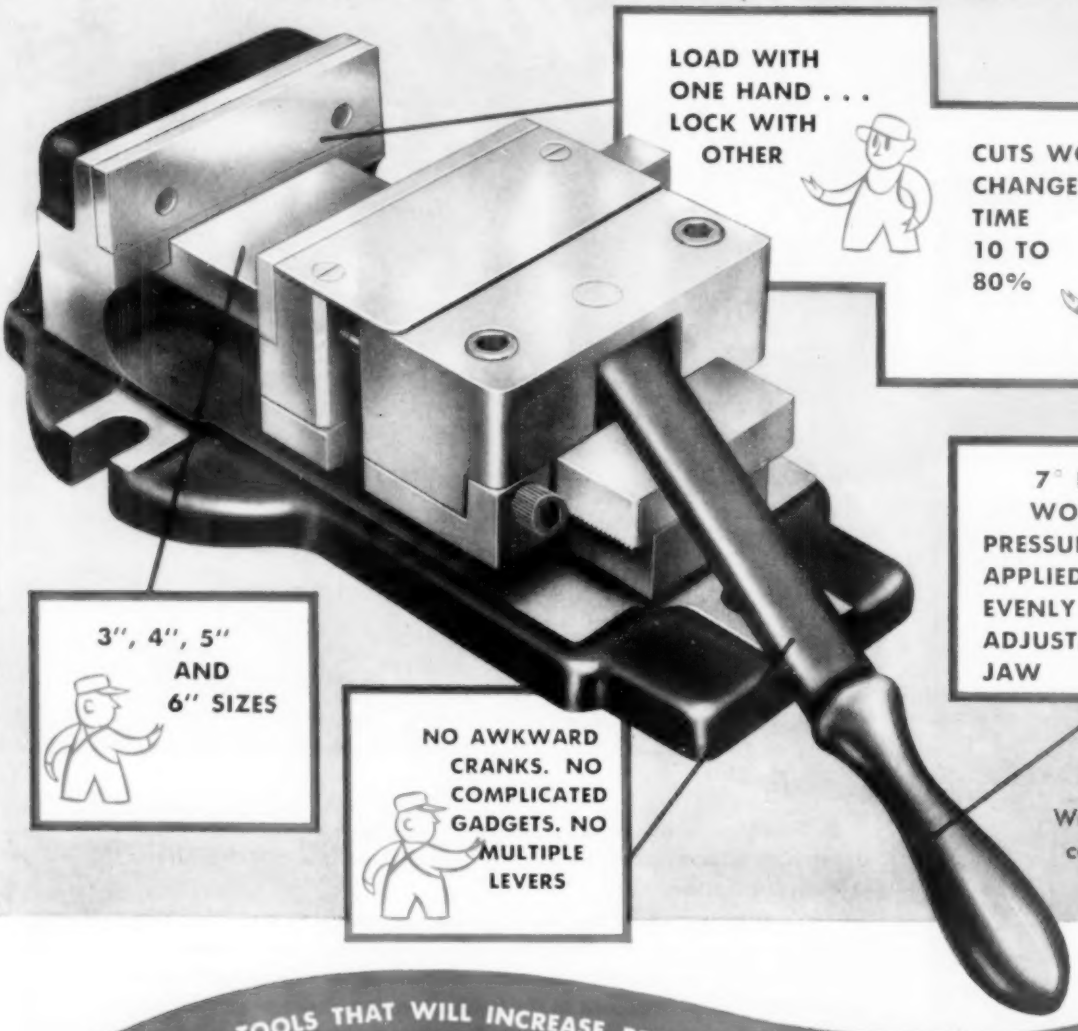

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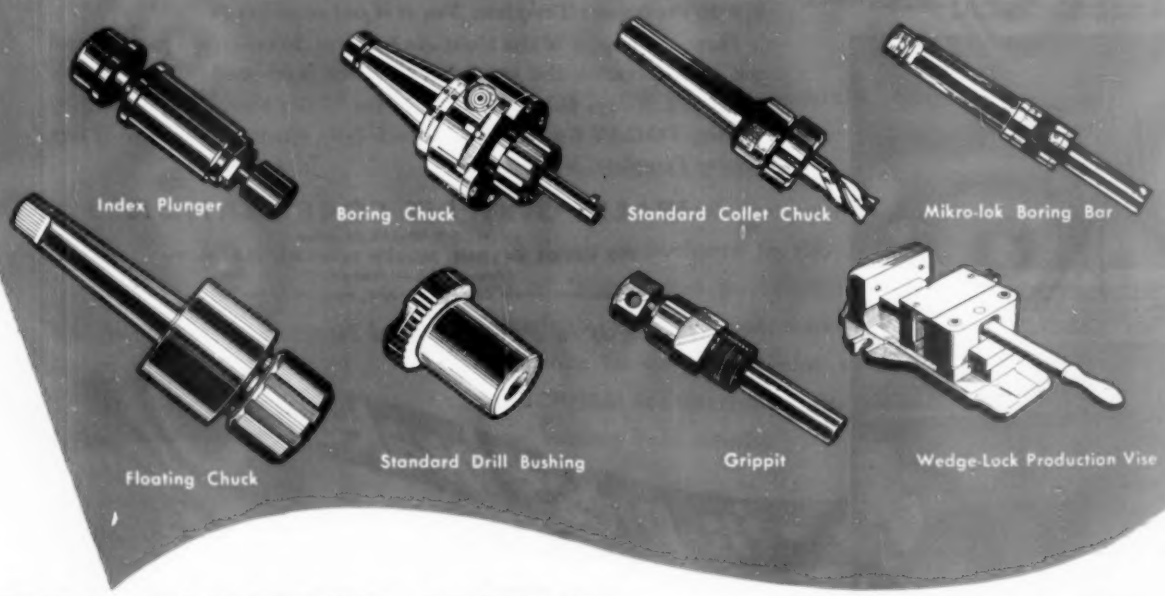

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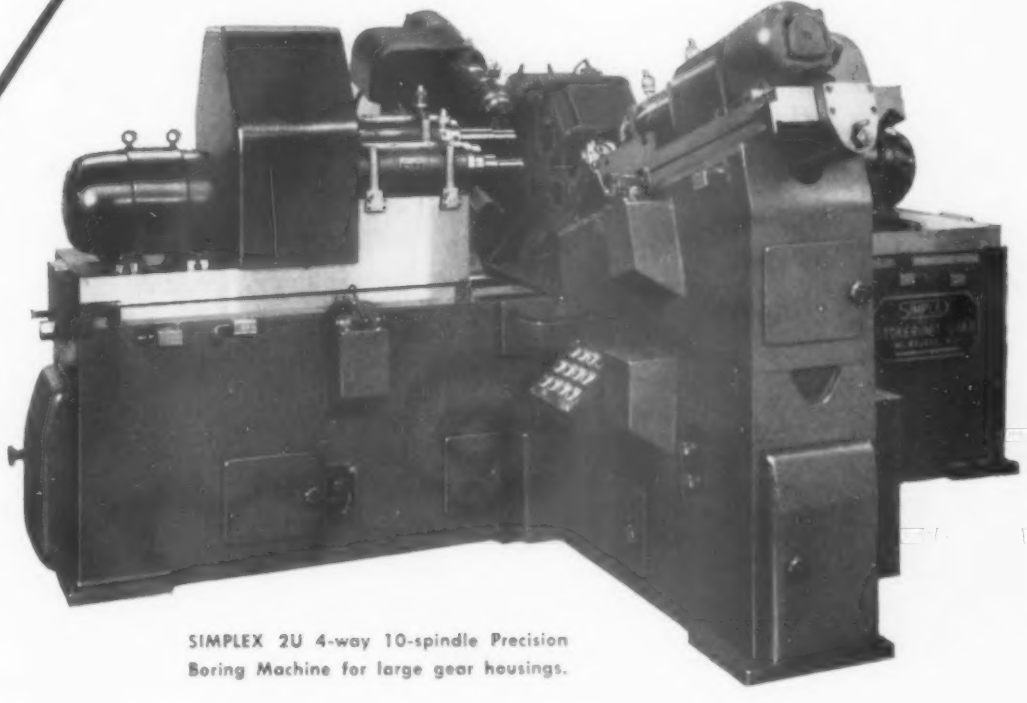

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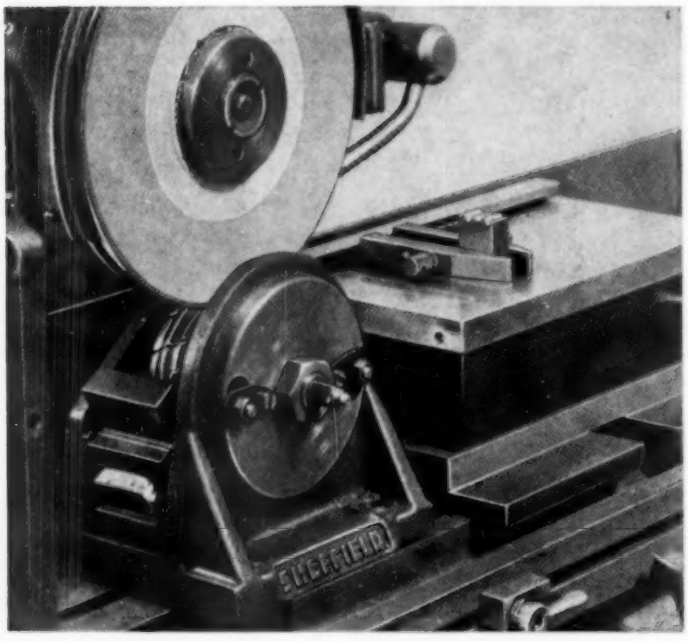

and
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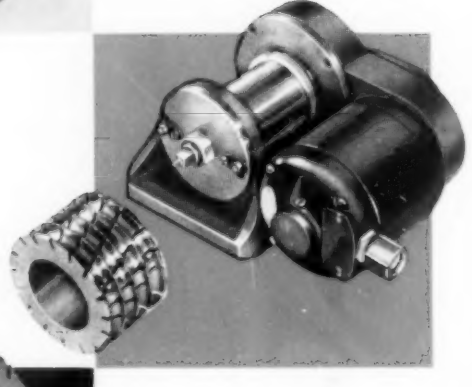

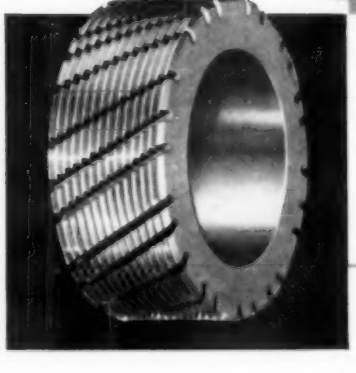

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